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Hatanaka et al.

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(45) **Date of Patent: Mar. 12, 2019**

(54) **WOVEN MATERIALS AND METHODS OF FORMING WOVEN MATERIALS**

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(22) Filed: **Jul. 2, 2015**

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Related U.S. Application Data

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(51) **Int. Cl.**

D03D 13/00	(2006.01)
D06C 7/00	(2006.01)
D03D 3/00	(2006.01)
D03D 11/02	(2006.01)

(52) **U.S. Cl.**

CPC ***D06C 7/00*** (2013.01); ***D03D 3/005*** (2013.01); ***D03D 11/02*** (2013.01); ***D03D 13/00*** (2013.01); ***D03D 13/004*** (2013.01)

(58) **Field of Classification Search**

CPC D03D 13/00

See application file for complete search history.

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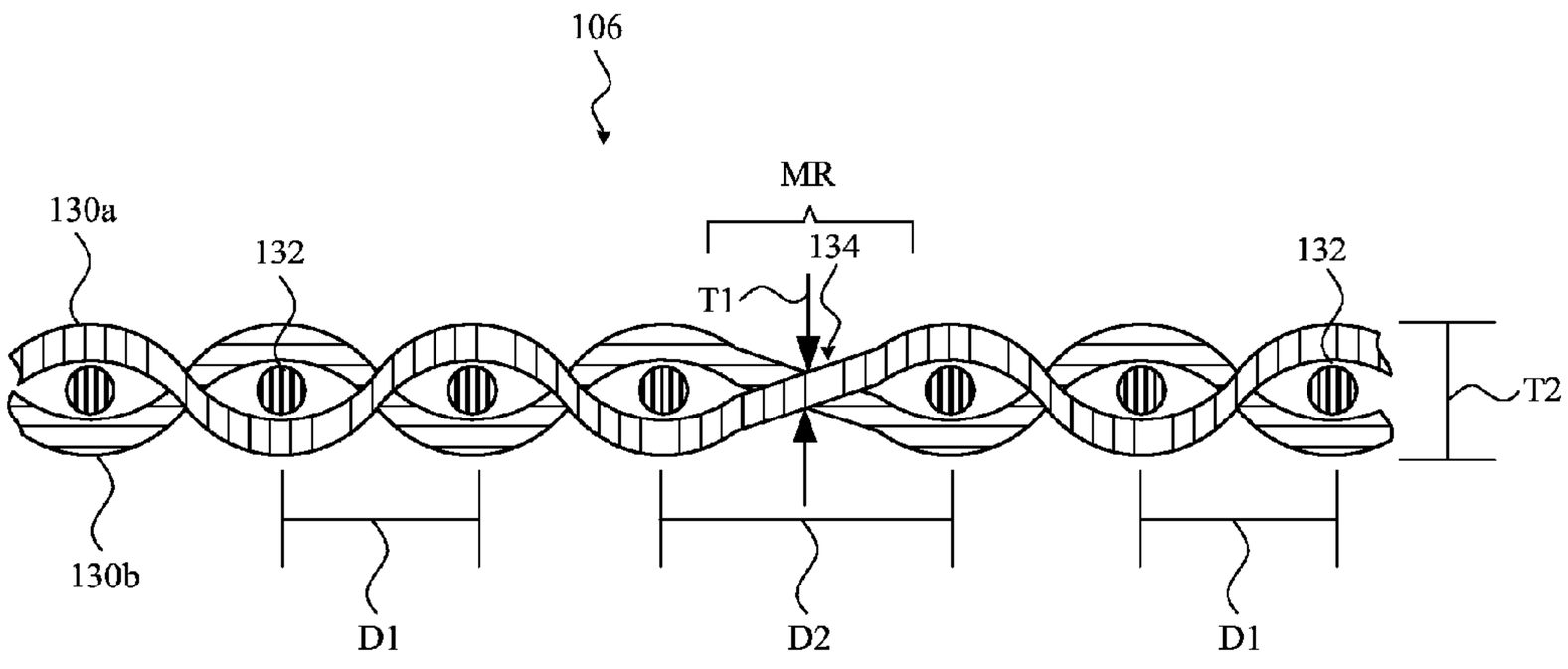
Primary Examiner — Andrew T Piziali

(74) *Attorney, Agent, or Firm* — Morgan, Lewis & Bockius LLP

(57) **ABSTRACT**

Woven material and altering the weave pattern of the woven material. The woven material may comprise a first portion comprising a weave pattern formed by a plurality of warp threads and at least one weft thread woven between the plurality of warp threads. The first portion may have a first thickness. The woven material may also comprise a locally thinned portion positioned adjacent the first portion. The locally thinned portion may comprise an altered weave pattern, which may comprise the plurality of warp threads positioned on a single side of the at least one weft thread, and/or the at least one weft thread woven between the plurality of warp threads in the locally thinned portion is separated by a first distance. The first distance may be greater than a second distance positioned between the at least one weft thread woven between the plurality of warp threads in the first portion.

16 Claims, 20 Drawing Sheets



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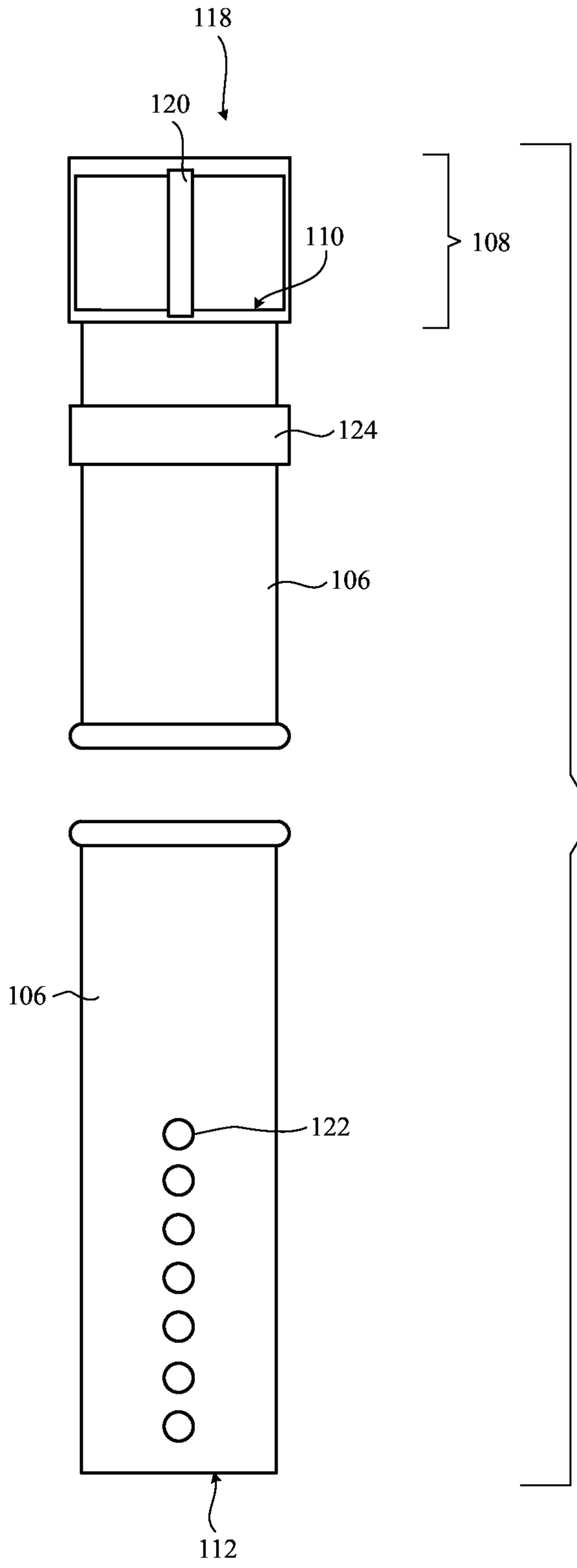


FIG. 1

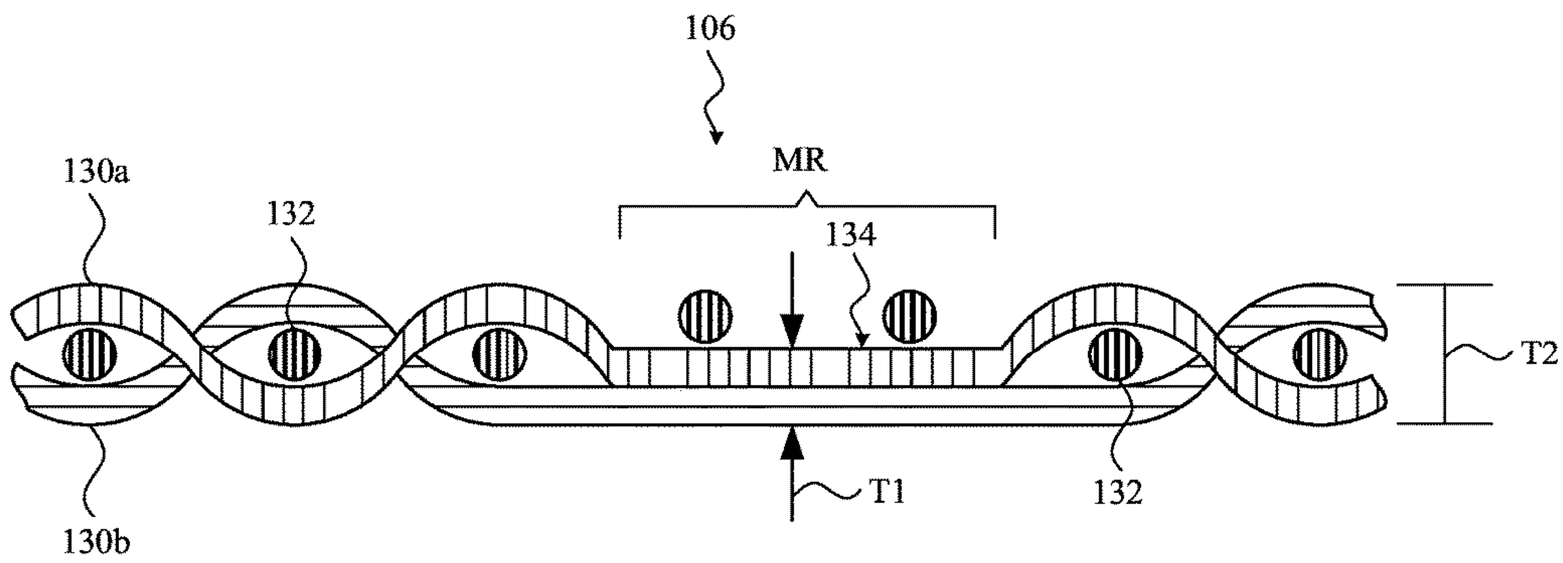
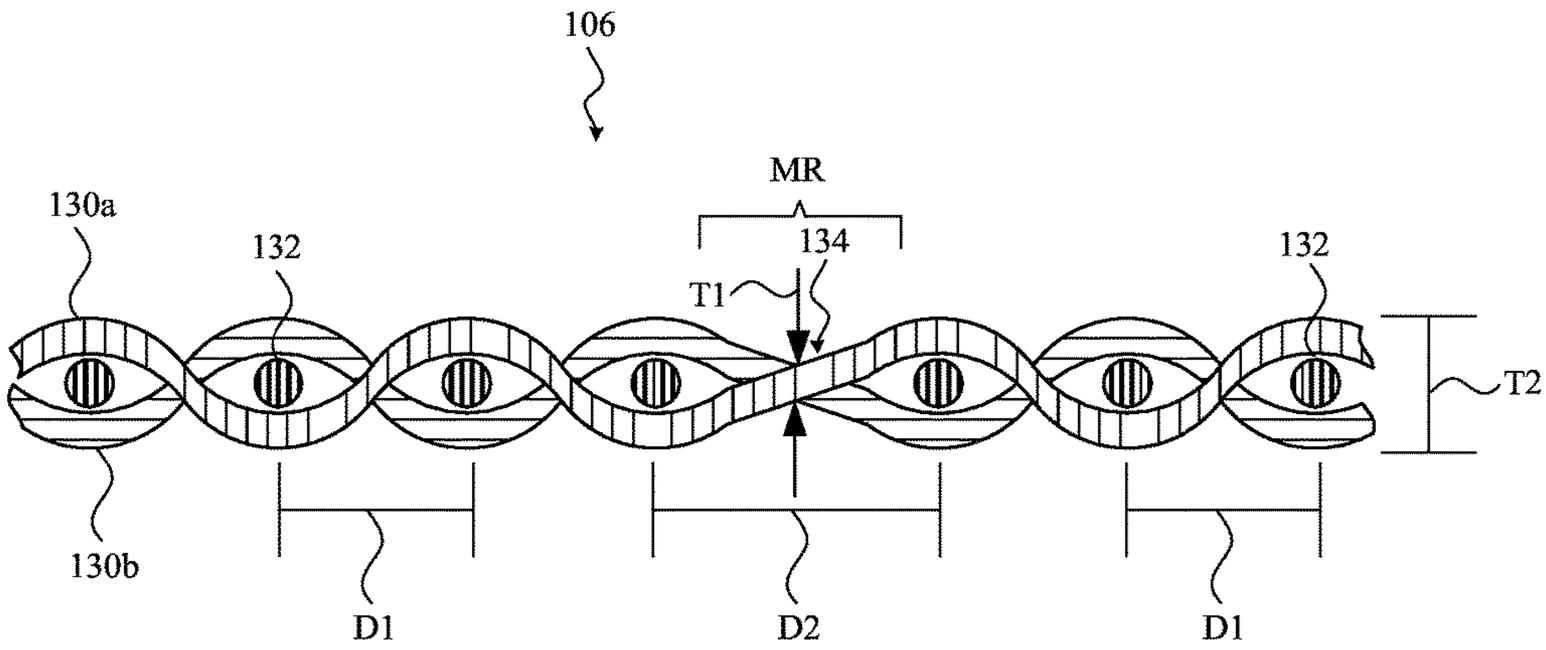

106
130a
132
MR
134
T2
T1
132
130b

FIG. 2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MR
130a
132
134
T1
132
T2
130b
D1
D2
D1

FIG. 3

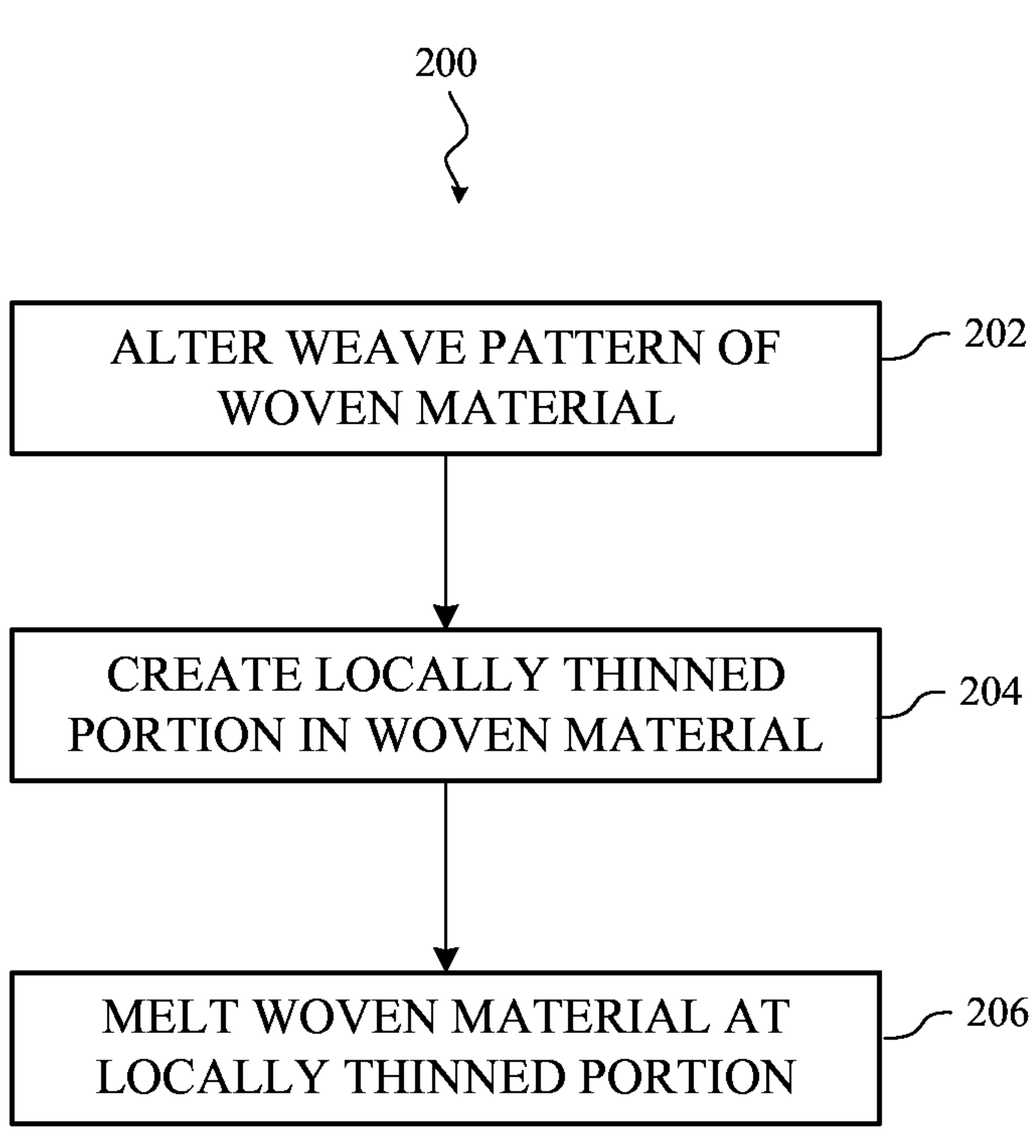
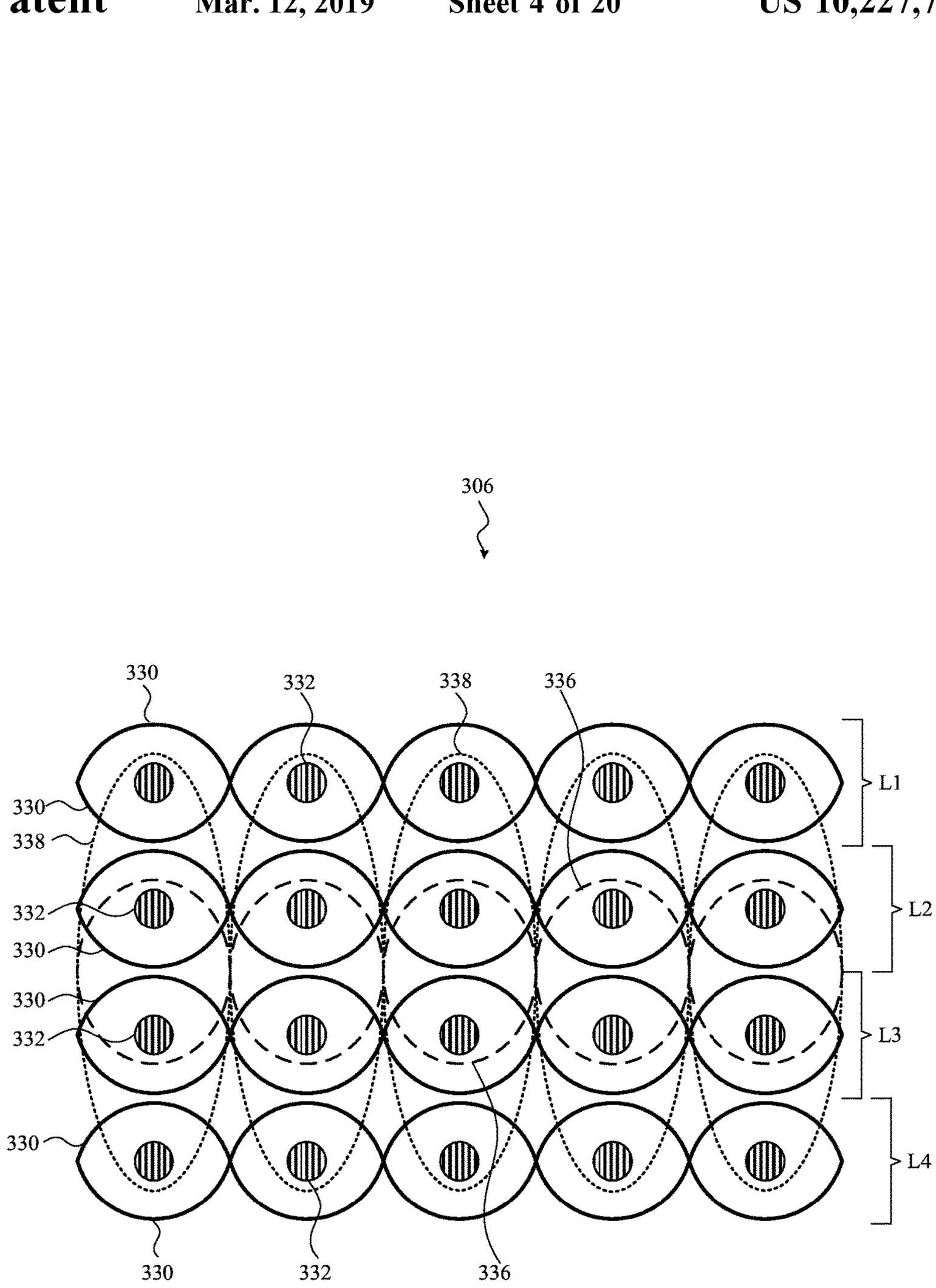

200
ALTER WEAVE PATTERN OF WOVEN MATERIAL
202
CREATE LOCALLY THINNED PORTION IN WOVEN MATERIAL
204
MELT WOVEN MATERIAL AT LOCALLY THINNED PORTION
206

FIG. 4


306
330
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338
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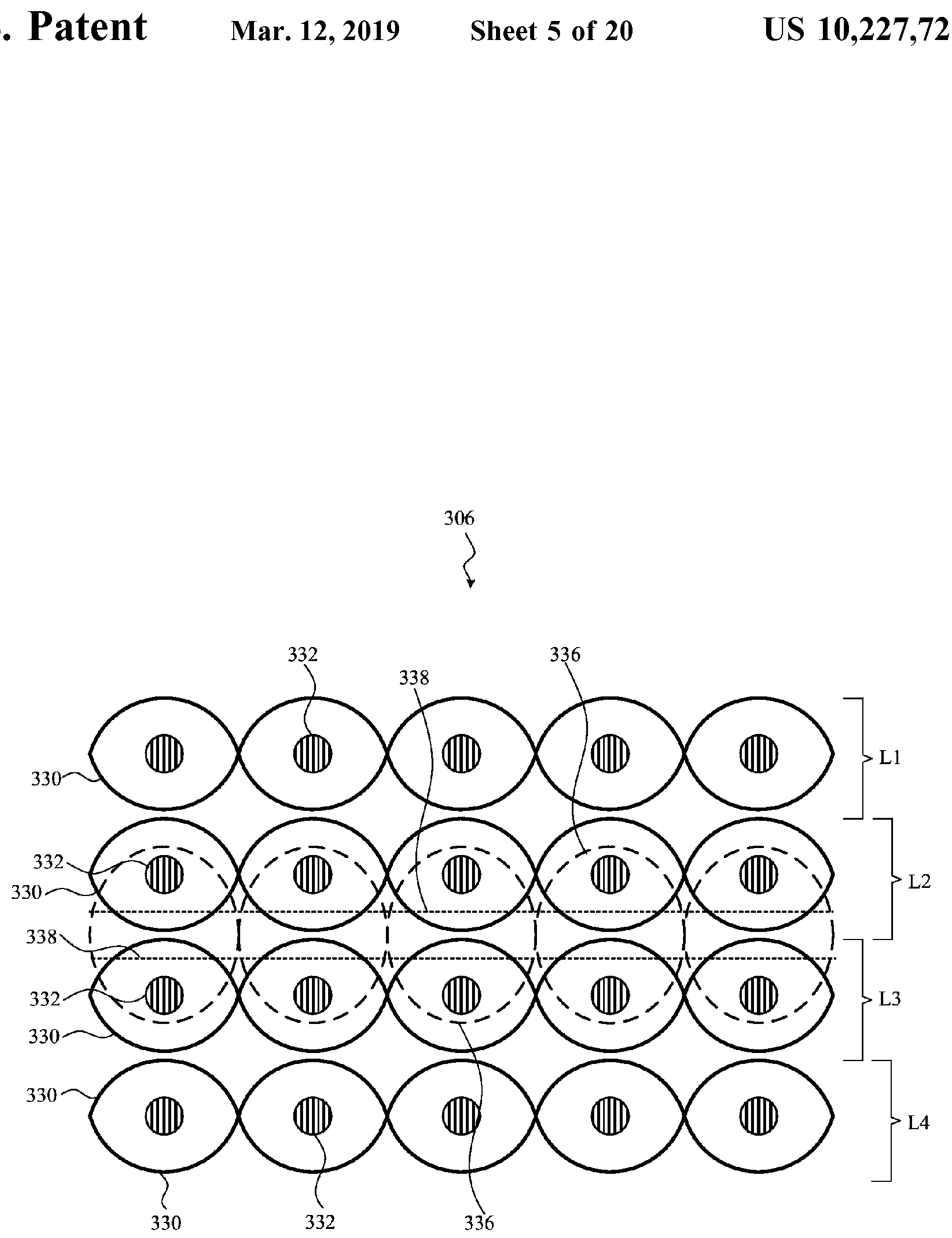
330
338
332
330
330
332
330
L1
L2
L3
L4
330
332
336

FIG. 5


306
332
338
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330
L1
332
330
L2
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L3
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L4
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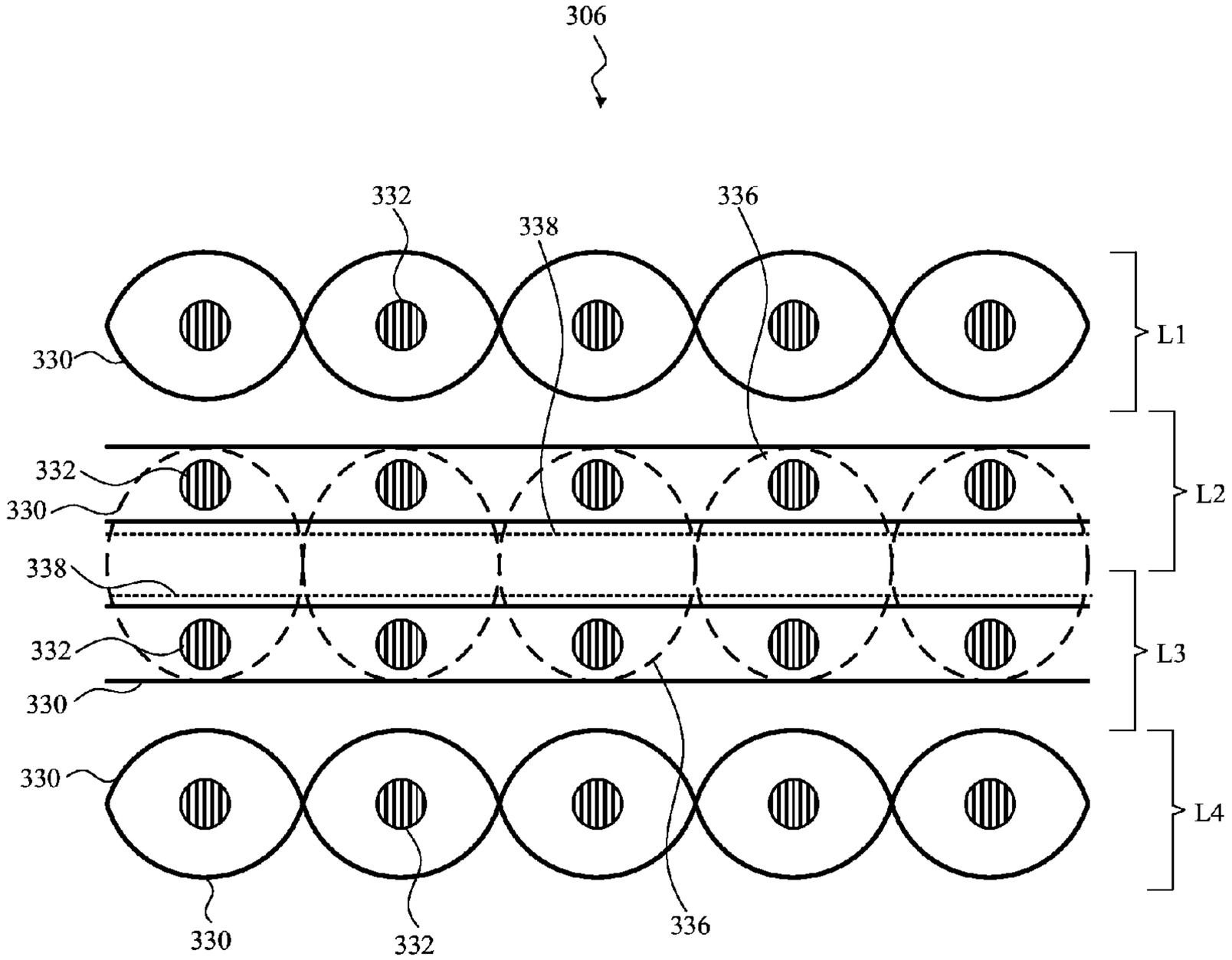
332
336

FIG. 6


306
332
338
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L1
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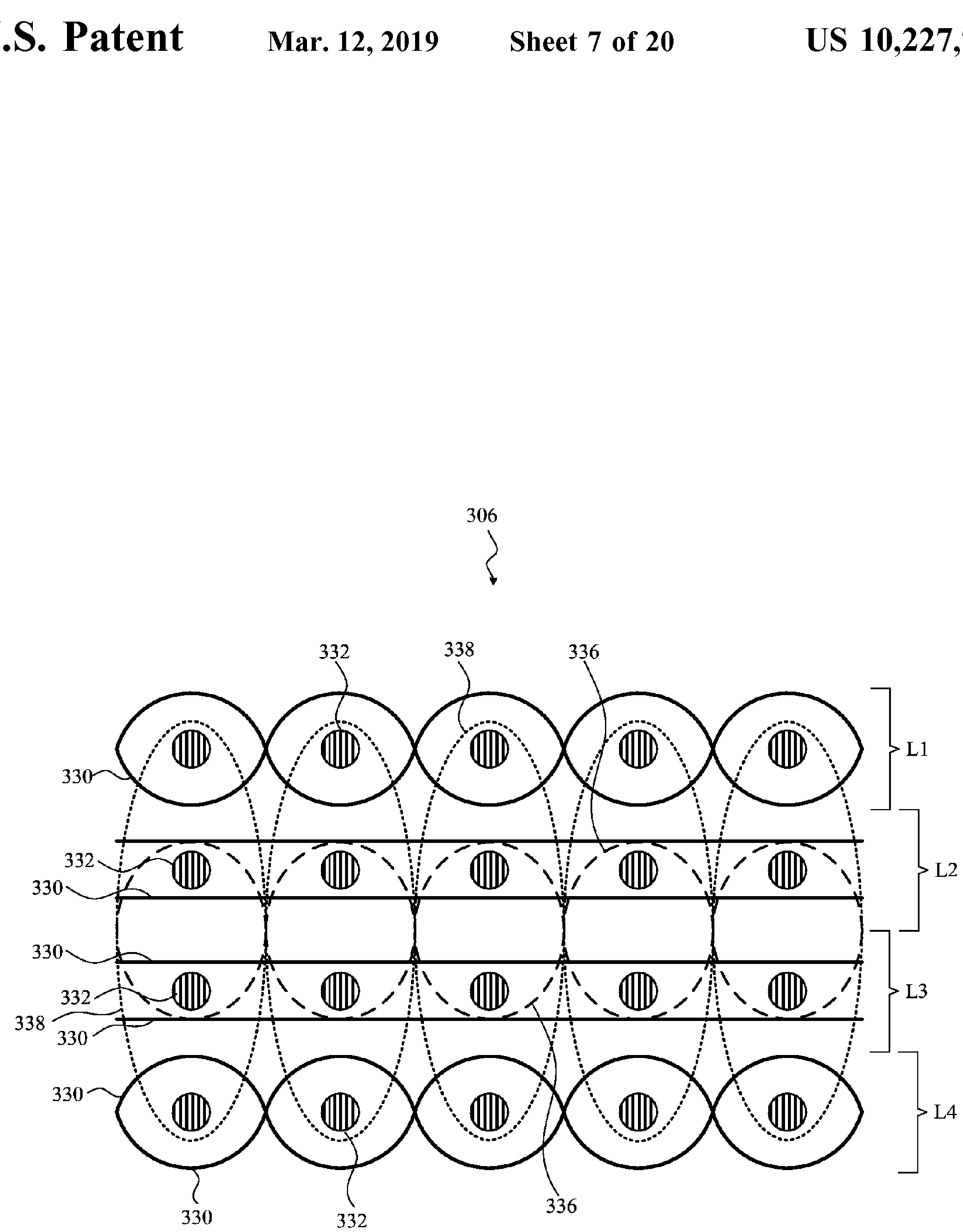
L2
338
332
330
L3
330
L4
330
332
336

FIG. 7


306
332
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330
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330
332
336
L1
L2
L3
L4

FIG. 8

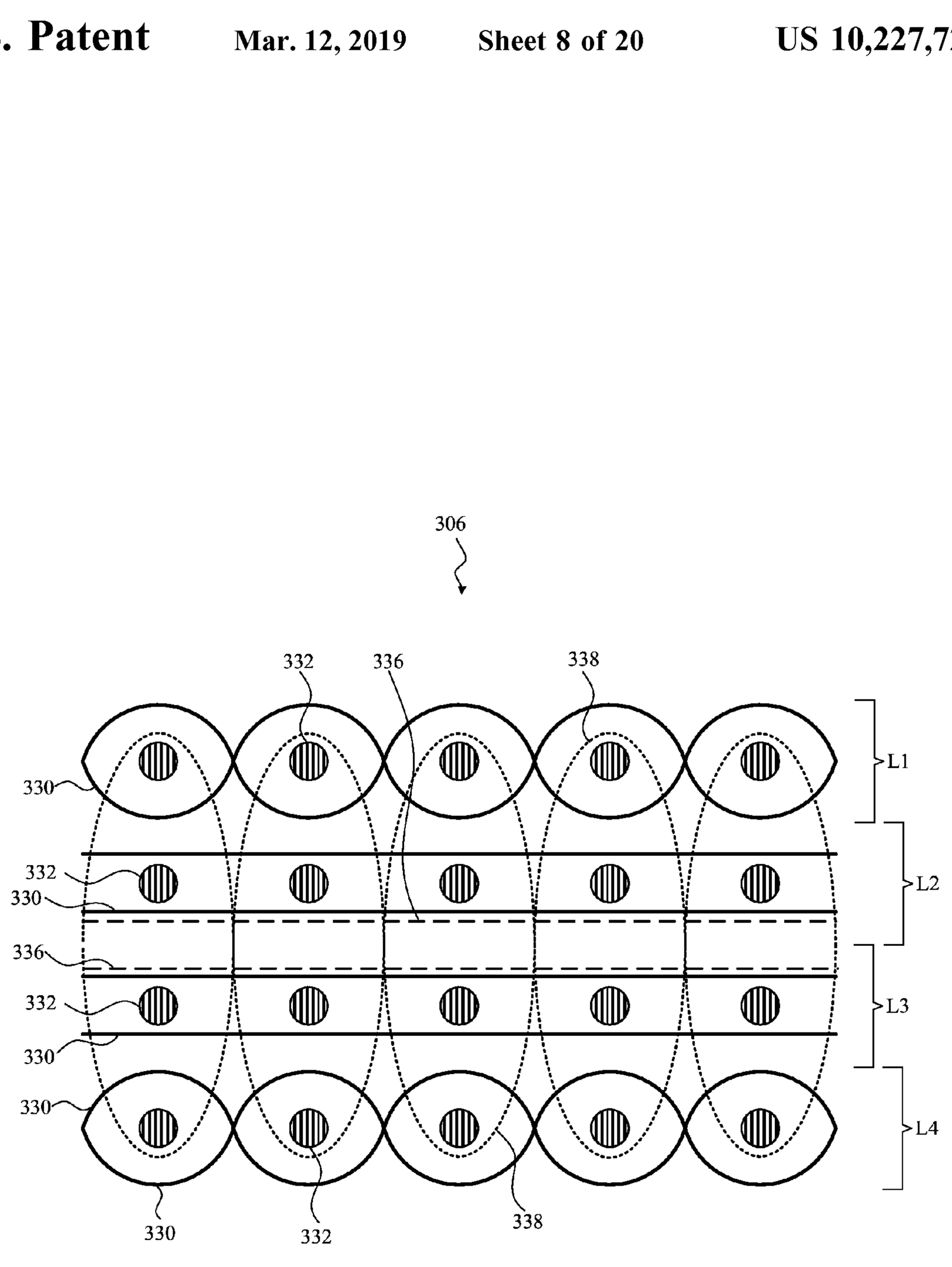
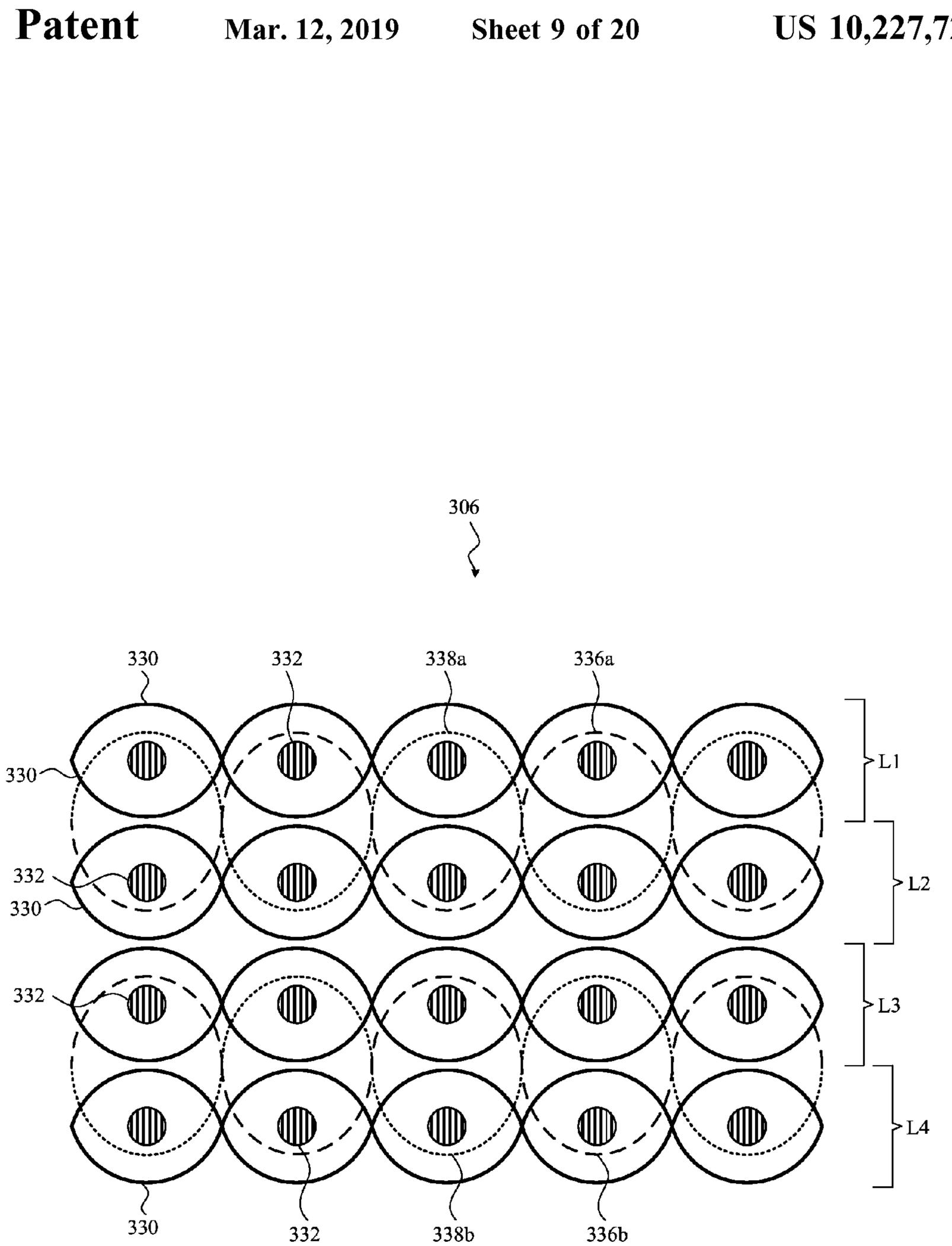


FIG. 9


306
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330
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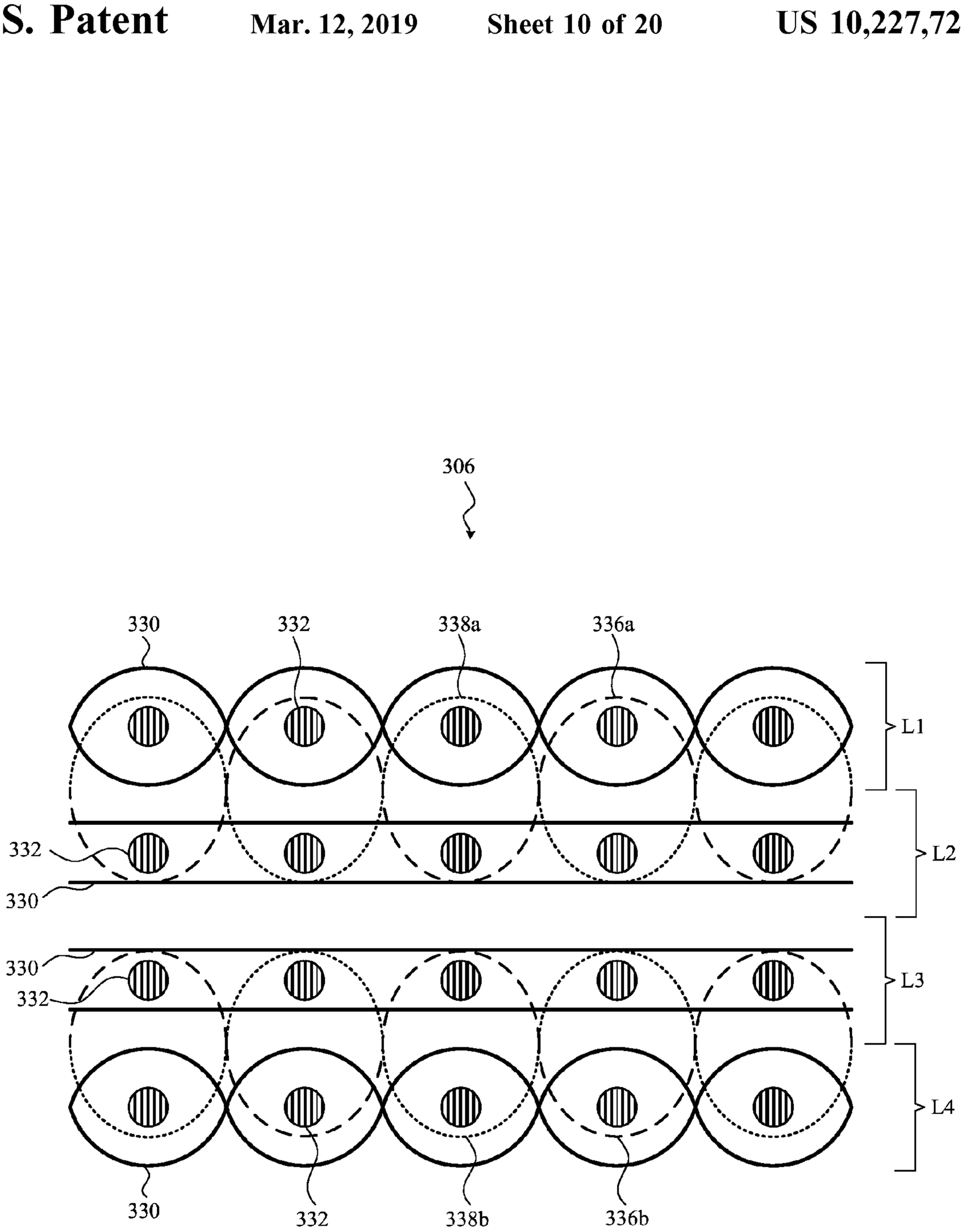
338b
336b
L1
L2
L3
L4

FIG. 10


306
330
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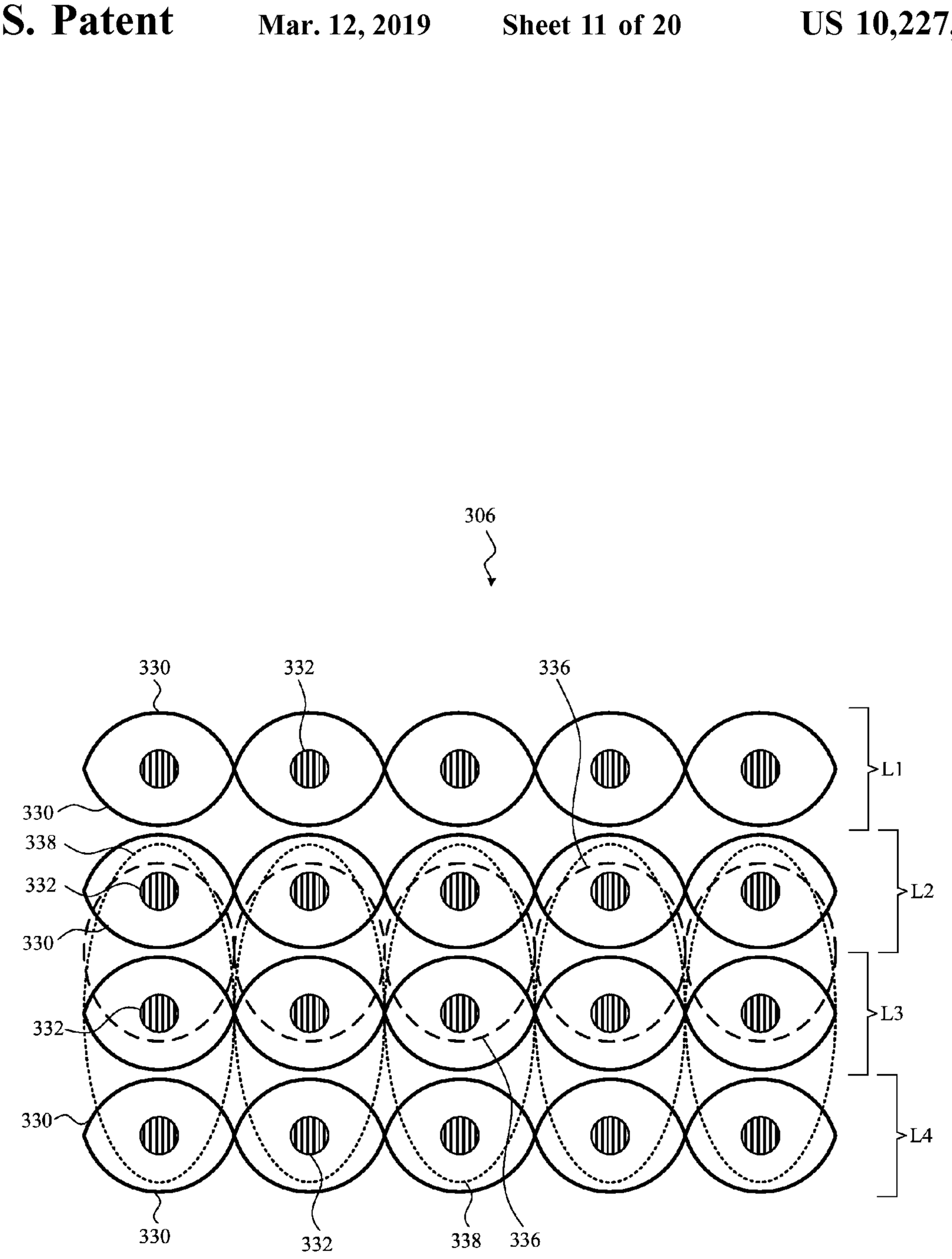
338a
336a
L1
L2
332
330
330
332
L3
L4
330
332
338b
336b

FIG. 11


306
330
332
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L1
330
338
332
L2
330
L3
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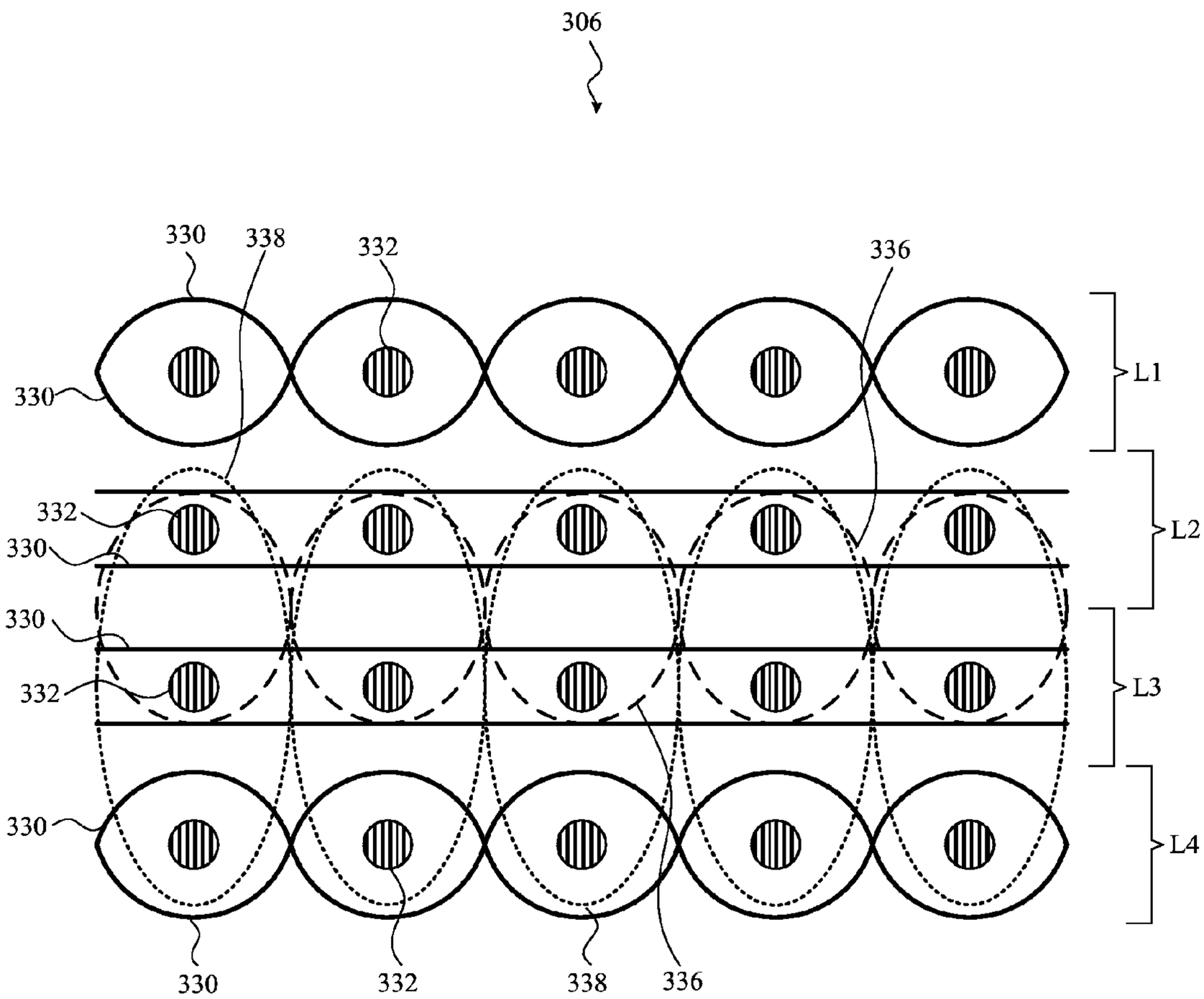
L4
330
332
338
336

FIG. 12


306
330
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L1
332
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L2
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L3
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L4
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332
338
336

FIG. 13

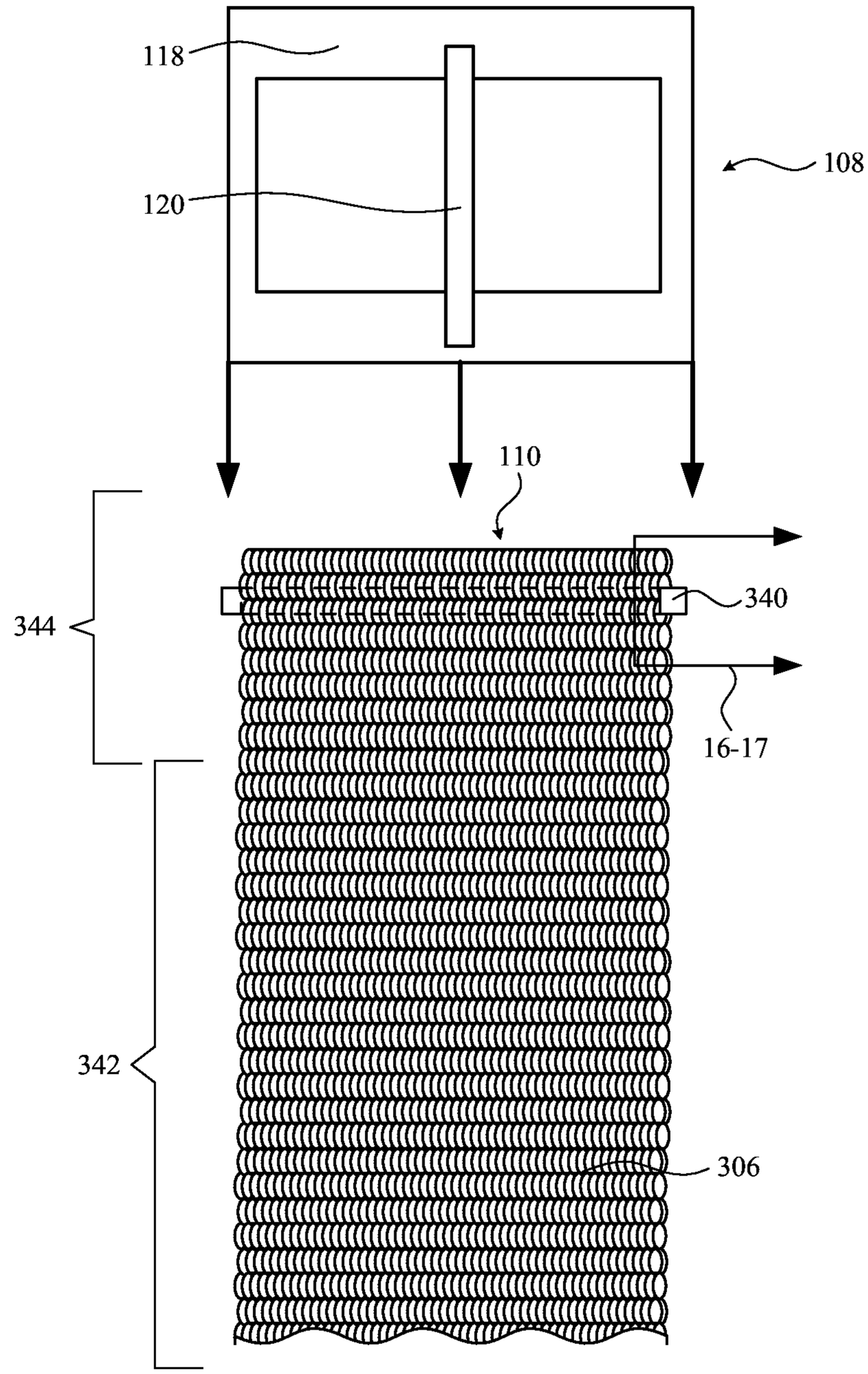

FIG. 14

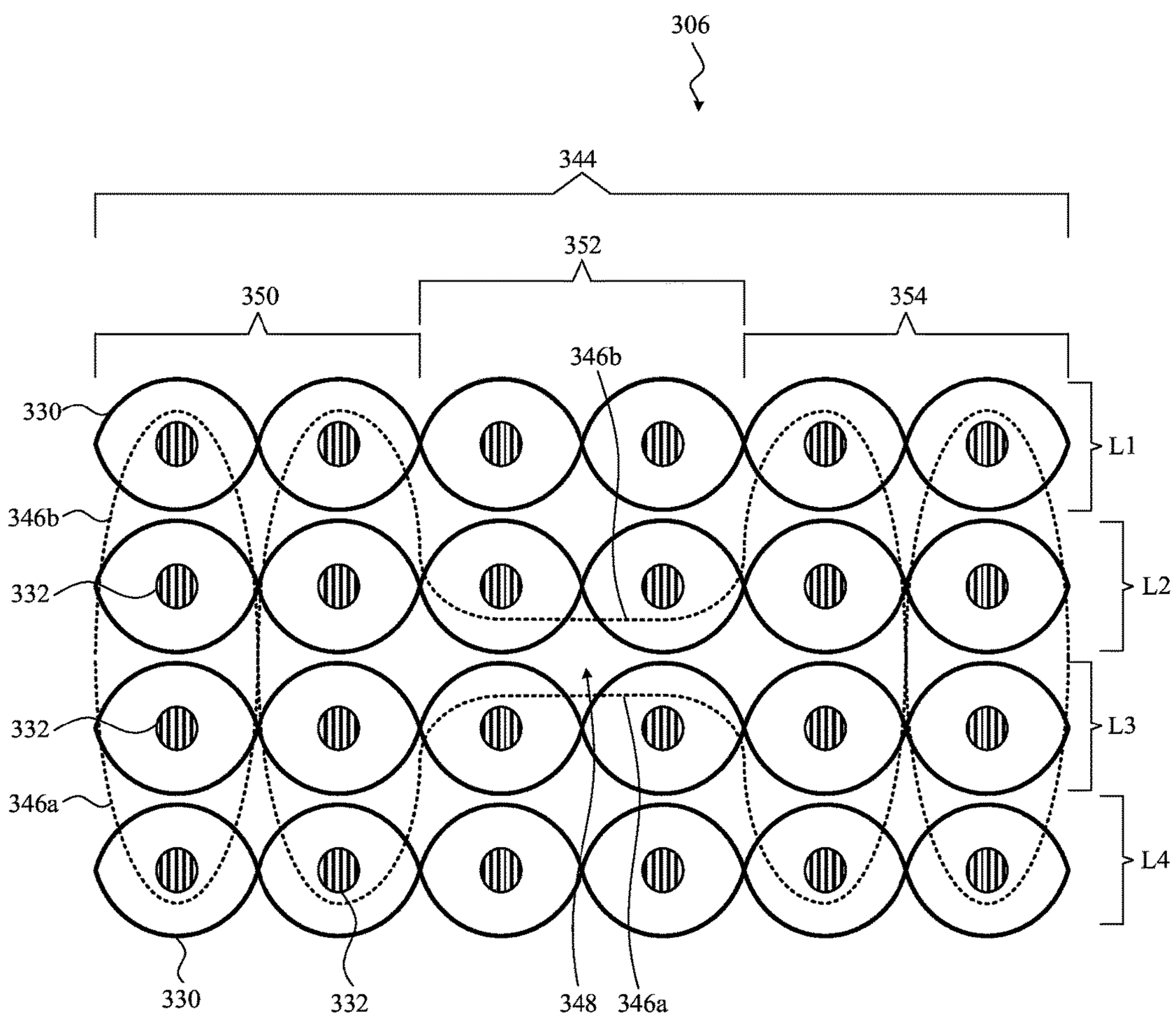
306
344
352
350
354
346b
330
346b
332
332
346a
L1
L2
L3
L4
330
332
348
346a

FIG. 15

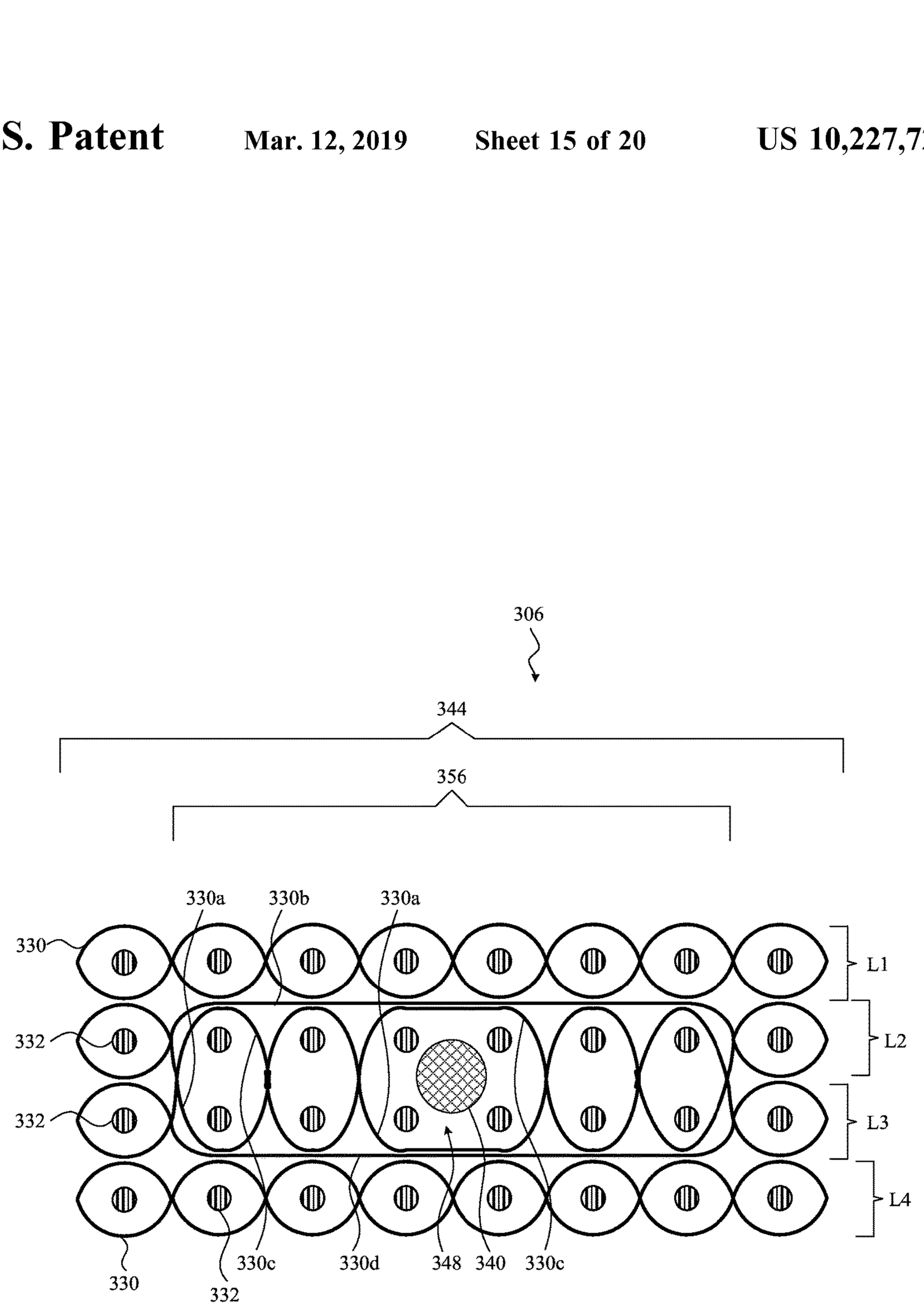
306
344
356
330a
330b
330a
330
L1
332
L2
332
L3
L4
330
330c
330d
348
340
330c
330
332

FIG. 16

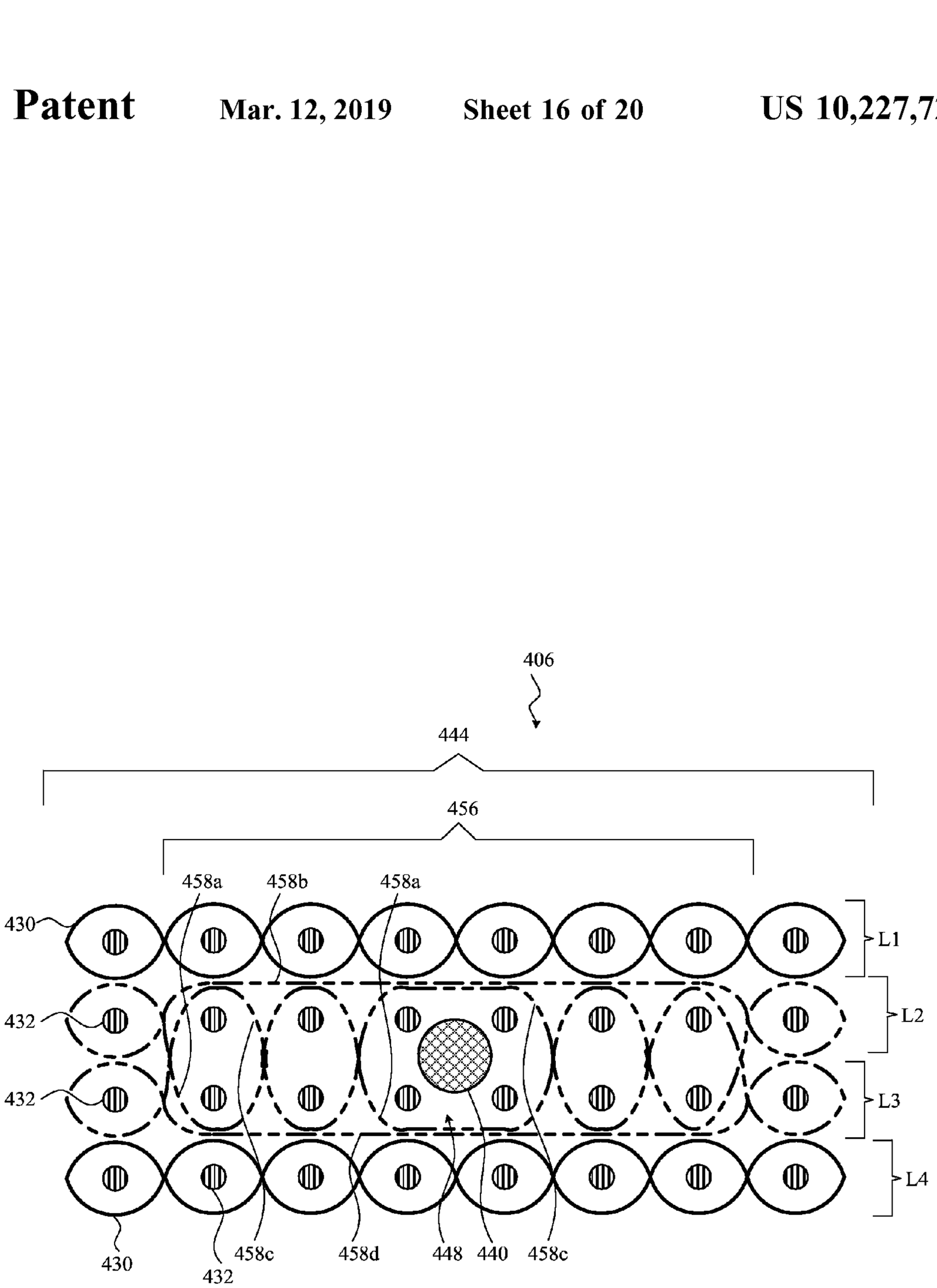
406
444
456
458a
458b
458a
430
L1
432
L2
432
L3
L4
430
432
458c
458d
448
440
458c

FIG. 17A

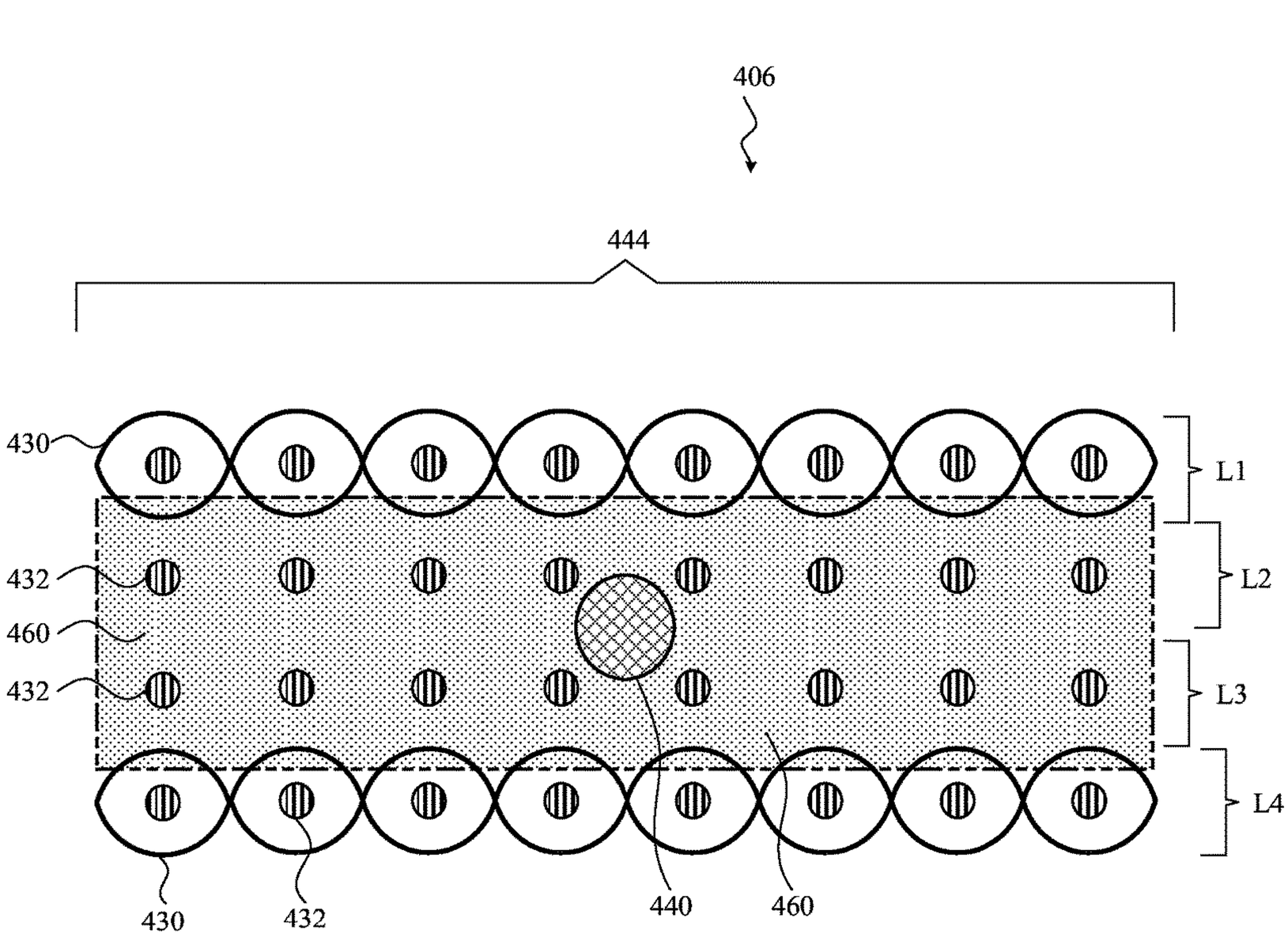

FIG. 17B

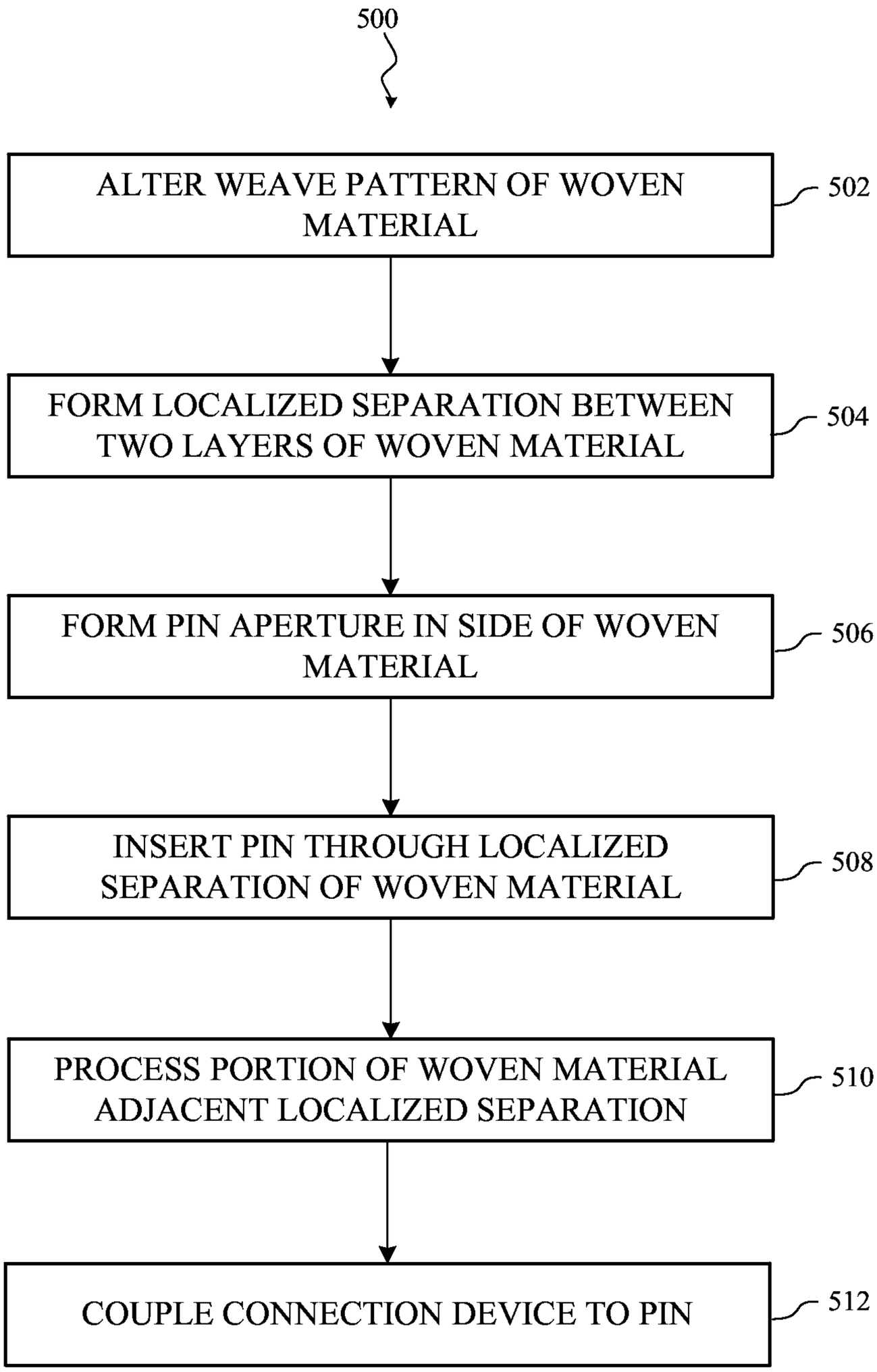
500
ALTER WEAVE PATTERN OF WOVEN MATERIAL
502
FORM LOCALIZED SEPARATION BETWEEN TWO LAYERS OF WOVEN MATERIAL
504
FORM PIN APERTURE IN SIDE OF WOVEN MATERIAL
506
INSERT PIN THROUGH LOCALIZED SEPARATION OF WOVEN MATERIAL
508
PROCESS PORTION OF WOVEN MATERIAL ADJACENT LOCALIZED SEPARATION
510
COUPLE CONNECTION DEVICE TO PIN
512

FIG. 18

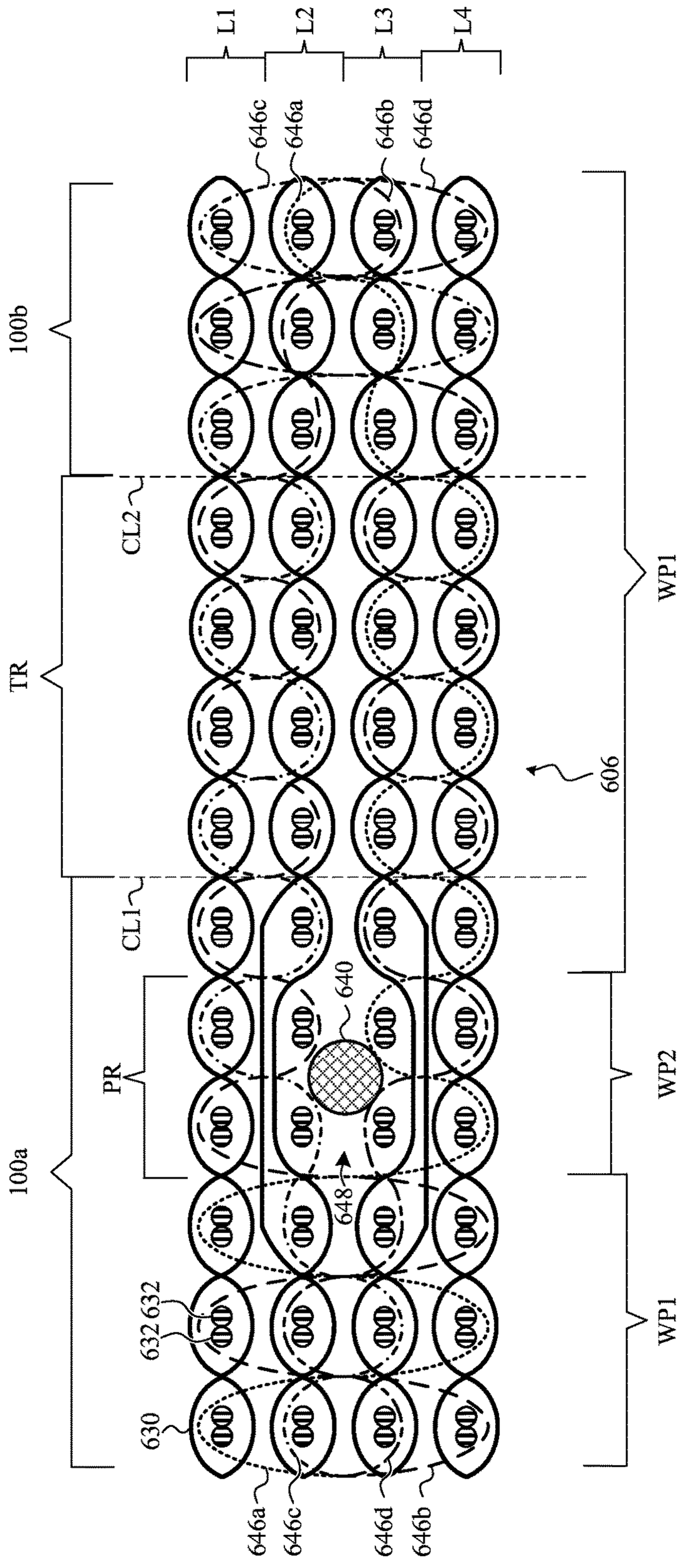
L1
L2
L3
L4
646c
646a
646b
646d
100b
TR
CL2
CL1
PR
100a
640
648
632
632
630
606
WP1
WP2
WP1
646a
646c
646d
646b

FIG. 19

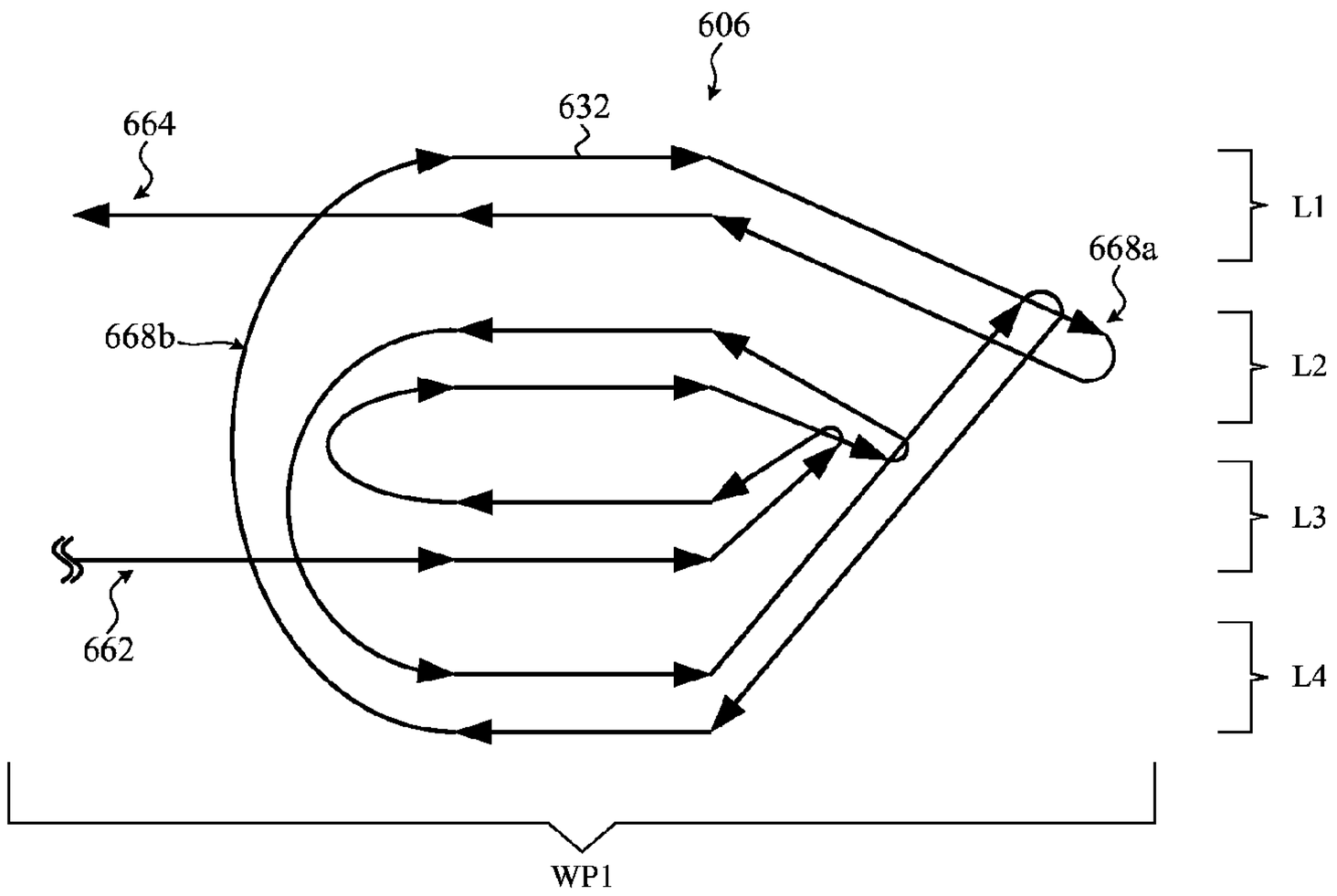
606
632
664
668a
668b
662
L1
L2
L3
L4
WP1

FIG. 20

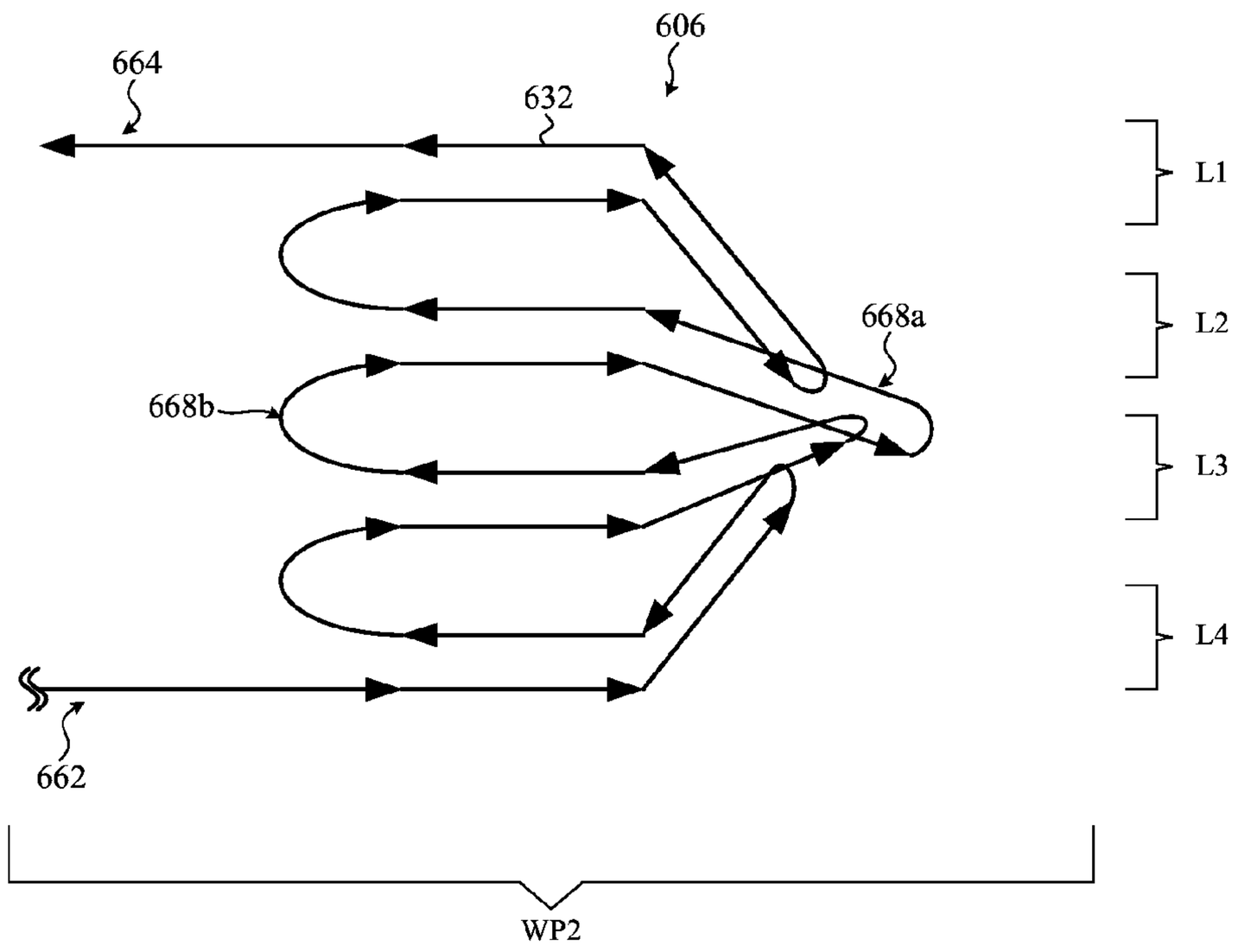
606
664
632
668a
668b
662
L1
L2
L3
L4
WP2

FIG. 21

WOVEN MATERIALS AND METHODS OF FORMING WOVEN MATERIALS

CROSS-REFERENCE TO RELATED APPLICATION

This application is a nonprovisional patent application of and claims the benefit of U.S. Provisional Patent Application No. 62/129,679, filed Mar. 6, 2015 and titled "Woven Materials and Methods of Forming Woven Materials," the disclosure of which is hereby incorporated herein by reference in its entirety.

FIELD

The disclosure relates generally to woven materials, and more particularly to the woven material and altering the weave pattern of the woven materials to improve physical characteristics and/or visual and/or tactile features.

BACKGROUND

Conventional woven material or fabric is used in a plurality of applications or industries. For example, woven material is used in clothing/apparel (e.g., shirts, pants, skirts, etc.), in fashion accessories (e.g., bracelets, watch bands, necklaces, etc.), in electronics (e.g., woven conductive layers, protective outer sheaths for optical fiber cables), and other various industrial applications (e.g., rope, tape, protective gear, household/kitchenware, and so on). Due to the many uses and applications, conventional woven material is manufactured using specific material and/or manufactured to include specific physical properties. For example, where the woven material is used to form a bracelet or necklace, it may be desired that the woven material be flexible to contour around the surface in which the woven material is worn (e.g., wrist, neck) and be durable, flexible and/or capable of withstanding typical wear/treatment of a bracelet or necklace.

However, conventional woven material may be difficult to process and/or maintain a desired appearance while processing. For example, when pressing or melting conventional woven material, the material may expand, become discolored, and/or lose its uniform shape and appearance. From a visual and cosmetic viewpoint, this may be less than desirable when the conventional woven material is being utilized as a fashion accessory.

In addition, because of the construction and/or weave pattern, conventional woven material may be substantially stiff and/or immovable. Additionally, the conventional construction and/or weave pattern of the woven material may make accessing interior portions or layers of the woven material difficult, as thread of the woven material is woven tightly to avoid coming undone (e.g., unwoven). These shortcomings of conventional woven material make it difficult to utilize the woven material in applications that require frequent flexing of the woven material and/or where an additional component may need to be positioned through and/or secured within the woven material.

SUMMARY

Generally, embodiments discussed herein are related to altering the weave pattern of woven materials to improve physical characteristics, and/or visual and/or tactile features of the material. The weave pattern of a woven material may be altered to provide a locally thinned portion in the woven material to improve the melting and pinching process performed on the woven material. Additionally, the locally thinned portion of the woven material may provide better cosmetic features and/or appearance of the melted/pinched woven material. Additionally, altering the weave pattern of the woven material may increase flexibility in the woven material and/or reduce stiffness. These changes in material characteristics (e.g., flexibility, stiffness) may be achieved locally or globally in the woven material, based on the amount of alteration achieved in the weave pattern of the woven material. Also, the weave pattern of the woven material may be altered to create a localized separation between the plurality of layers forming the woven material. This localized separation may allow components of the wearable band to be more easily inserted through and/or secured within the woven material used to form the wearable band of the electronic device. The altering of the weave pattern may be achieved by altering a weave pattern of the plurality of warp threads of the woven material, and/or at least one connection yarn woven through the woven material.

One embodiment may take the form of a woven material. The woven material may comprise a first portion comprising a weave pattern formed by a plurality of warp threads and at least one weft thread woven between the plurality of warp threads. The first portion may have a first thickness. The woven material may also comprise a locally thinned portion positioned adjacent the first portion. The locally thinned portion may comprise an altered weave pattern, which may comprise the plurality of warp threads positioned on a single side of the at least one weft thread, and/or the at least one weft thread woven between the plurality of warp threads in the locally thinned portion is separated by a first distance. The first distance may be greater than a second distance positioned between the at least one weft thread woven between the plurality of warp threads in the first portion.

Another embodiment may take the form of a method of forming a wearable band from woven material. The method may comprise altering a weave pattern of the woven material comprising at least one weft thread, and a plurality of warp threads. The altering of the weave pattern may comprise positioning the plurality of warp threads on a single side of the at least one weft thread, and/or increasing the distance between the at least one weft thread woven between the plurality of warp threads. The method may also comprise creating a locally thinned portion in the woven material at the altered weave pattern.

A further embodiment may take the form of a woven material. The woven material may comprise a first layer of warp threads, the first layer forming a top surface, a second layer of warp threads positioned adjacent the first layer, a third layer of warp threads positioned adjacent the second layer, and a fourth layer of warp threads positioned adjacent the third layer. The fourth layer may form a bottom surface. The woven material may also comprise at least one weft thread positioned between the warp threads over a length of the first layer, the second layer, the third layer, and the fourth layer. The woven material may further comprise at least one set of connection yarns woven through the at least one weft thread positioned between at least two distinct layers of warp threads.

An additional embodiment may take the form of a wearable electronic device comprising a housing, and a wearable band formed from a woven material coupled to the housing. The woven material may comprise a first layer of warp threads, the first layer forming a top surface, a second layer of warp threads positioned adjacent the first layer, a third

layer of warp threads positioned adjacent the second layer, and a fourth layer of warp threads positioned adjacent the third layer. The fourth layer may form a bottom surface. The woven material may also comprise at least one weft thread positioned between the warp threads over a length of the first layer, the second layer, the third layer, and the fourth layer. The woven material may further comprise a localized separation between two distinct layers of warp threads in a portion of the woven material.

Another embodiment may take the form of a method of forming a wearable band assembly formed from a woven material. The method may comprise altering a weave pattern in a portion of the woven material forming the wearable band assembly. The woven material may comprise four distinct layers of warp threads, and at least one weft thread woven through the warp threads for each of the four distinct layers. The method may also comprise forming a localized separation between two distinct layers of the four distinct layers of the woven material, the localized separation formed between the two distinct layers of the woven material for receiving a pin.

An additional embodiment may take the form of a woven material forming at least two distinct wearable bands. The woven material may comprise four distinct layers of a plurality of warp threads, and at least one weft thread positioned between the four distinct layers of the plurality of warp threads. The at least one weft thread may be woven through each of the four distinct layers of the plurality of warp threads twice between the plurality of warp thread alternating between being positioned above or below the at least one weft thread. The woven material may also comprise four distinct connection yarns woven through the at least one weft thread positioned between the plurality of warp threads, and a localized separation formed between two distinct layers of the four distinct layers of the plurality of warp threads.

BRIEF DESCRIPTION OF THE DRAWINGS

The disclosure will be readily understood by the following detailed description in conjunction with the accompanying drawings, wherein like reference numerals designate like structural elements, and in which:

FIG. **1** depicts an illustrative top view of the wearable band for a wearable electronic device, according to embodiments.

FIGS. **2** and **3** depict illustrative side cross-section views of a woven material having an altered weave pattern and a localized thinning, according to embodiments.

FIG. **4** depicts a flow chart of an example process for forming a wearable band assembly from a woven material, according to embodiments.

FIG. **5** depicts an illustrative side cross-section view of a woven material having four distinct layers of warp threads and at least one connection yarn, according to embodiments.

FIGS. **6-13** depict illustrative side cross-section view of the woven material having four distinct layers of warp threads and at least one connection yarn of FIG. **5** in altered weave patterns, according to further embodiments.

FIG. **14** depicts an illustrative enlarged front view of a woven material used to form an end of the wearable band of FIG. **1**, according to embodiments.

FIGS. **15** and **16** depict illustrative side cross-section views of the woven material having an altered weave pattern taken along line **15-16** of FIG. **14**, according to various embodiments.

FIG. **17**A depicts an illustrative side cross-section view of the woven material of FIG. **14** having an altered weave pattern before performing a melting process, according to embodiments.

FIG. **17**B depicts an illustrative side cross-section view of the woven material of FIG. **14** having an altered weave pattern after performing a melting process, according to embodiments.

FIG. **18** depicts a flow chart of an example process for forming a wearable band assembly from a woven material, according to embodiments.

FIG. **19** depicts an illustrative side cross-section view of a woven material having an altered weave pattern used to form multiple wearable bands, according to various embodiments.

FIG. **20** depicts an illustrative front view of a weft thread of the woven material of FIG. **19** woven using a first weave pattern, according to embodiments.

FIG. **21** depicts an illustrative front view of a weft thread of the woven material of FIG. **19** woven using a second weave pattern, according to embodiments.

It is noted that the drawings of the invention are not necessarily to scale. The drawings are intended to depict only typical aspects of the invention, and therefore should not be considered as limiting the scope of the invention. In the drawings, like numbering represents like elements between the drawings.

DETAILED DESCRIPTION

Reference will now be made in detail to representative embodiments illustrated in the accompanying drawings. It should be understood that the following descriptions are not intended to limit the embodiments to one preferred embodiment. To the contrary, it is intended to cover alternatives, modifications, and equivalents as can be included within the spirit and scope of the described embodiments as defined by the appended claims.

The following disclosure relates generally to woven materials, and more particularly to the woven material and altering the weave pattern of the woven materials to improve physical characteristics and/or visual and/or tactile features.

The weave pattern of a woven material may be altered to provide a locally thinned portion in the woven material to improve the melting and pinching process performed on the woven material. Additionally, the locally thinned portion of the woven material may provide better cosmetic features and/or appearance of the melted/pinched woven material. Additionally, altering the weave pattern of the woven material may increase flexibility in the woven material and/or reduce stiffness. These changes in material characteristics (e.g., flexibility, stiffness) may be achieved locally or globally in the woven material based on the amount of alteration achieved in the weave pattern of the woven material. Also, the weave pattern of the woven material may be altered to create a localized separation between the plurality of layers forming the woven material. This localized separation may allow components of the wearable band to be more easily inserted through and/or secured within the woven material used to form the wearable band of the electronic device. The altering of the weave pattern may be achieved by altering a weave pattern of the plurality of warp threads of the woven material, and/or at least one connection yarn woven through the woven material.

These and other embodiments are discussed below with reference to FIGS. **1-21**. However, those skilled in the art will readily appreciate that the detailed description given

herein with respect to these Figures is for explanatory purposes only and should not be construed as limiting.

FIG. **1** shows an illustrative front view of wearable band **100** including woven material **106**, according to embodiments. In non-limiting examples, wearable band **100** may be a decorative band (e.g., wristband, armband, headband, necklace, etc.), a watch band, and a wearable band for holding or attaching to a housing of an electronic device including, but not limited to: a smartphone, a gaming device, a display, a digital music player, a wearable computing device or display, a health monitoring device or other suitable electronic device. In a non-limiting example shown in FIG. **1**, wearable band **100** may form a watch band that may be coupled to a housing of the wearable electronic device (e.g., watch).

Wearable band **100** may include connection device **108** positioned at a first end **110** of wearable band **100**. Connection device **108** may be formed within wearable band **100** to couple ends **110**, **112** and/or secure wearable band **100** to a user. Connection device **108** may be any suitable coupling mechanism or embodiment capable of releasably coupling ends **110**, **112** of wearable band **100**. In a non-limiting example, as shown in FIG. **1**, connection device **108** may include a buckle **118**. First end **110** of wearable band **100** may include buckle **118** having a tongue **120** coupled to buckle **118**. Buckle **118** may receive a portion of second end **112** of wearable band **100**, and tongue **120** may be positioned within one of a plurality of holes **122** formed adjacent second end **112** to secure wearable band **100** to a user. The plurality of holes **122** formed through wearable band **100** may be formed using any suitable process including, but not limited to laser cutting, shearing or punching. Additionally, and as discussed herein, connection device **108** (e.g., buckle **118**, tongue **120**) may be coupled to woven material **106** forming wearable band **100** using a pin (see, e.g., FIG. **14**) positioned through a portion of woven material **106**.

Second end **112** may be further secured to wearable band **100** using retention loop **124** positioned substantially around wearable band **100**. Retention loop **124** may form an opening (not shown) located between wearable band **100** and retention loop **124**, where the opening may receive second end **112** and/or position second end **112** against a portion of wearable band **100**.

Woven material **106** forming wearable band **100** may be formed from a large piece of woven material **106** that may be substantially cut or shaped to a desired size. In a non-limiting example, woven material **106** may be cut from a larger piece of woven material **106** to form wearable band **100** using a laser cutting process. The laser used in the laser cutting process may substantially cut the woven material **106** to a desired dimension of wearable band **100** from the larger piece of woven material. Additionally, the laser in the laser cutting process may simultaneously cauterize and/or round the edges of woven material **106** forming wearable band **100** to prevent fraying of woven material **106**. Although discussed herein as being laser cut, it is understood that woven material **106** may undergo any suitable cutting or shearing process to form wearable band **100**.

Additionally, the laser cutting process may also form woven material **106** to include second end **112** that may be secured to the remaining portion of wearable band **100** without altering the cosmetic appearance and/or geometry of woven material **106** and/or wearable band **100**. That is second end **112** may be cut to include a specific geometry during the laser cutting process, such that when coupled or secured to wearable band **100** and/or retention loop **124**, second end **112** is cosmetically and/or geometrically similar to the remaining portion of woven material **106**. As discussed herein, the weave pattern, and ultimately the dimensions, of woven material **106** may be altered in areas of woven material **106** that may be cut when forming wearable band **100**.

Although shown as two distinct portions, it is understood that wearable band **100** may be formed from a single piece of woven material **106**. In one non-limiting example, the single piece of woven material **106** forming wearable band **100** may have elastic properties, such that the wearable band **100** may be a single, continuous loop of woven material **106** and may stretch around a user's wrist. In another non-limiting example, the single piece of woven material **106** forming wearable band **100** may have a loop positioned on end **110** that may receive end **112**, and end **112** may be folded back onto and coupled to portions of wearable band **100** to secure wearable band **100** to a user's wrist. In this non-limiting example, end **112** inserted through the loop position on end **110** and/or at least a portion of wearable band **100** contacting end **112** may include any suitable coupling component or feature that may couple end **112** to wearable band **100** including, but not limited to, Velcro, magnets, clips and so on.

Additionally, although discussed herein as being formed from a large piece of woven material **106**, it is understood that wearable band **100** may be formed by weaving threads to size. That is, and in a non-limiting example, wearable band **100** may not be cut from a larger piece of woven material **106**, but rather woven material **106** may be woven to a desired size of wearable band **100**, and may not undergo a cutting process, as discussed herein. However, in the non-limiting example where wearable band **100** is formed from woven material **106** woven to size, the ends of woven material **106** may undergo additional processes, for example crimping, to improve physical characteristics, and/or visual and/or tactile features.

When forming wearable band **100** from woven material **106**, it may be desired to produce a cosmetically appealing wearable band **100**. As discussed herein, wearable band **100** may be formed from a piece of woven material **106** that may be cut (e.g., laser cut) to a desired dimension. During the cutting process, a desired cosmetic appearance (e.g., uniform thickness, reduced thickness) for the ends of wearable band **100** may be achieved by reducing a thickness of a portion of woven material **106** that may be cut when forming wearable band **100**.

FIG. **2** shows a side cross-section view of a portion of woven material **106** used to form wearable band **100** of FIG. **1**. Woven material **106** may be formed from a plurality of warp threads **130***a*, **130***b*, and at least one weft thread **132** coupled to the warp threads **130***a*, **130***b*. The plurality of warp threads **130***a*, **130***b* may be positioned or extend along a length of wearable band **100** (e.g., between first end **110** and second end **112**), and at least one weft thread **132** positioned perpendicular to, and coupled to, woven or interlaced between the plurality of warp threads **130***a*, **130***b*. In the non-limiting example shown in FIG. **2**, the plurality of warp threads **130***a*, **130***b* may continuously alternate position, and/or may alternate between being above and below weft thread **132** coupled to, woven or interlaced between the plurality of warp threads **130***a*, **130***b*. Woven material **106**, as discussed herein, may be formed using any suitable weaving technique and/or weaving machinery. In a non-limiting example, woven material **106** may be formed using a dobby loom.

Warp threads **130***a*, **130***b* and the weft thread **132** may be formed from any suitable material capable of being coupled,

woven or interlaced with each other to form woven material **106**. In a non-limiting example, warp threads **130***a*, **130***b* and weft thread **132** of woven material **106** may be formed from or include a polyamide (e.g., nylon) material, a polyester material, thermoplastic polyethylene (e.g., Dyneema) or a polypropylene material. Warp threads **130***a*, **130***b* and weft thread **132** of woven material **106** may also be formed from any other suitable polymer material that may include similar physical characteristics as polyester and/or polypropylene. Warp threads **130***a*, **130***b* and weft thread **132** may be formed from the same material or may be formed from distinct materials when forming woven material **106**.

It is understood that the number of threads shown in FIG. **2** to form woven material **106** may be merely exemplary, and may not represent the actual number of warp threads and/or weft threads used to form woven material **106**. In a non-limiting example, woven material **106** may be formed from more than 200 warp threads and a single weft thread coupled to, woven or interlaced between the plurality of warp threads. In another non-limiting example, the at least one weft thread **132** may be formed from a single thread that may be continuously woven between warp threads **130***a*, **130***b*, or may be formed from a plurality of threads that may be woven between warp threads **130***a*, **130***b*. In conjunction, the spacing between the warp threads and/or weft threads as shown in FIG. **2** may also be merely exemplary for the purpose of clearly and completely describing woven material **106**. It is understood that the space between the threads of woven material **106** may only be large enough to couple and/or weave at least one weft thread through the plurality of warp threads (e.g., 200 warp threads) to form woven material **106**. Additionally, the spacing between the threads of woven material **106** may be substantially minimal such that a user may not be able to see through woven material **106**.

As shown in FIG. **2**, the weave pattern of woven material **106** may be modified and/or altered to produce a localized thinning and/or material-thickness reduction in a portion of woven material **106**. The locally thinned portion **134** for woven material **106** may be achieved by altering the weave pattern, such that both warp threads **130***a*, **130***b* may be on a single side of weft thread **132**. In the non-limiting example shown in FIG. **2**, warp threads **130***a*, **130***b* may be positioned below weft thread **132** for a length of woven material **106** that includes two passes of weft thread **132** over warp threads **130***a*, **130***b*. The weave pattern of woven material **106** may resume and/or may continue after locally thinned portion **134** is formed in the portion of woven material **106**.

The thickness (T**1**) of woven material **106** in the locally thinned portion **134** may be smaller than the thickness (T**2**) of the remaining portions of woven material **106**. In the non-limiting example shown in FIG. **2**, the altering of the weave pattern of woven material **106** to position both warp threads **130***a*, **130***b* below weft thread **132** may form the localized thinned portion **134** of woven material **106** having a thickness (T**1**) that may be less than the thickness (T**2**) of the portions of woven material **106** having weft thread **132** positioned between warp threads **130***a*, **130***b*, respectively.

The locally thinned portion **134** of woven material **106** may form and/or define a melt region (MR) in woven material **106**. The melt region (MR) may include a portion of woven material **106** that may be melted and/or pinched to form a thinned portion of woven material **106** of wearable band **100** (see, FIG. **1**). The reduced thickness in melt region (MR) may undergo a melting process (e.g., hot pressing) and/or a pinching process to produce a melted and thinned portion of woven material **106**, that may subsequently form ends (e.g., first end **110**, second end **112**) for wearable band **100**. By melting and pinching melt region (MR) having locally thinned portion **134**, the melt region (MR) may have a reduced thickness when forming ends and/or may have a desirable cosmetic appearance by reducing fraying and/or preventing unwoven threads. As discussed herein with respect to FIG. **1**, the end **112** of wearable band **100** may be inserted within retention loop **124** of wearable band **100**. In another non-limiting example where melt region (MR) may also be embossed then laser cut, the thickness in melt region (MR) may slightly increase as a result of the melting of the threads during the embossing process. However, because of the reduced thickness (T**1**) of melt region (MR), the embossing and cutting process performed on melt region (MR) may result in the end of wearable band **100** having a uniform thickness with the remaining portion of wearable band **100**.

Woven material **106** also may form a locally thinned portion without substantially altering the weave pattern of warp threads **130***a*, **130***b*. For example, and as shown in FIG. **3**, localized thinning and/or material thickness reduction of woven material **106** may be achieved by increasing the distance between weft thread **132**. In the non-limiting example, the locally thinned portion **134** of woven material **106** forming melt region (MR) may be formed by increasing the distance between weft thread **132** as it is coupled to, woven or interlaced between the plurality of warp threads **130***a*, **130***b*. As shown in FIG. **3**, the weave pattern for woven material **106** may include weft thread **132** being spaced or woven equal distant (D**1**) from itself as warp threads **130***a*, **130***b* alternate between positions (e.g., above weft thread, below weft thread). However, a portion of woven material **106** may include a localized thinning **134** by increasing the distance (D**2**) between two distinct passes of weft thread **132** as it is woven through warp threads **130***a*, **130***b*. As shown in FIG. **3**, the weave pattern may not change the movement of warp threads **130***a*, **130***b* (e.g., above weft thread, below weft thread), however, the pitch of warp threads **130***a*, **130***b* may change due to the increase in the distance (D**2**) between distinct passes of weft thread **132**.

As a result, the thickness (T**1**) in the locally thinned portion **134** of woven material **106**, which includes weft threads **132** separated by the increased distance (D**2**), may be smaller than the thickness (T**2**) of the remaining portion of woven material **106**, which includes weft threads **132** separated by equal distance (D**1**). Similar to FIG. **2**, the non-limiting example shown in FIG. **3** may form a melt region (MR) within woven material **106** having a reduced thickness that may undergo melting processes for creating a desired cosmetic appearance for woven material forming wearable band **100** (see, FIG. **1**). However, distinct from FIG. **2**, the weave pattern, and specifically the alternating position of warp threads **130***a*, **130***b*, of woven material **106** may not be altered or modified when forming the locally thinned portion **134** and/or melt region (MR) in woven material **106**. Rather only the distance between two distinct passes of weft thread **132** may be increased as it is woven through and/or positioned between warp threads **130***a*, **130***b*, as shown in FIG. **3**.

It is understood that the size and/or length of melt region (MR) formed in woven material **106** shown in FIGS. **2** and **3** may be merely exemplary, and may not limit the size of the melt region (MR). In the non-limiting example shown in FIG. **2**, warp threads **130***a*, **130***b* may be positioned underneath weft thread **132** for more or less than two passes of the weft thread **132** through woven material **106**, which may result in an increase or decrease, respectively, in the size and/or length of melt region (MR). Additionally in the

non-limiting example shown in FIG. **3**, the distance (D**2**) between weft thread **132** may be increased to also increase the size and/or length of melt region (MR) formed in woven material **106**.

Additionally, although shown only using two warp threads **130***a*, **130***b*, the altered weave pattern shown in FIGS. **2** and **3** to achieve a locally thinned portion **134** may be formed in woven material including more than two warp threads. Additionally, the altered weave pattern shown in FIGS. **2** and **3** may be formed in a woven material having a plurality of layers of warp threads, as discussed herein, to form locally thinned portion **134** and/or melt region (MR) in the multi-warp thread layer woven material.

FIG. **4** depicts an example process for forming a wearable band for an electronic device. Specifically, FIG. **4** is a flowchart depicting one example process **200** for forming a wearable band from a woven material. In some cases, the process may be used to form the wearable band from woven material, as discussed above with respect to FIGS. **1-3**.

In operation **202**, a weave pattern of a woven material may be altered. The woven material may include at least one weft thread and a plurality of warp threads. In at least a portion of the woven material, the at least one weft thread may be coupled to, woven or interlaced between the plurality of warp threads. Additionally, each of the plurality of warp threads may alternate between being positioned above and below the weft thread, where at least one of the plurality of warp threads is positioned on an opposite side of the weft thread than a distinct warp thread. The altering of the weave pattern may further include positioning the plurality of warp threads on a single side of the at least one weft thread for a predetermined length of the woven material. In an additional non-limiting example, the altering of the weave pattern may further include increasing the distance between the at least one weft thread woven between the plurality of warp threads. The increase in the distance between the at least one weft thread may be over a predetermined length and/or number of passes of the weft thread within the woven material.

In operation **204**, a locally thinned portion may be created in the woven material. The locally thinned portion of the woven material may be created in the portion of the woven material including the altered weave pattern. In a non-limiting example, the locally thinned portion may be formed in the predetermined length of woven material where the plurality of warp threads are positioned on the same side of the weft thread. In another non-limiting example, the locally thinned portion of the woven material may be formed in the predetermined length of the plurality of warp threads positioned between the at least one weft thread spaced an increased distance apart.

In operation **206**, the woven material may be melted at the locally thinned portion. In a non-limiting example, the woven material may undergo a melting process to melt and fuse threads of the woven material. The woven material may be melted within the locally thinned portion of the woven material to improve cosmetic and visual effect of the end of the wearable band. Additionally, by melting the woven material in the locally thinned portion, the melting process of the woven material may be achieved more easily, as the thickness of the woven material is smaller than the thickness of portions of the woven material surrounding the locally thinned portion.

FIG. **5** shows a side cross-section view of a portion of another non-limiting example of woven material **306** used to form wearable band **100** of FIG. **1**. As shown in FIG. **5**, and similarly discussed herein with respect to FIG. **3**, woven material **306** may include a plurality of warp threads **330** and at least one weft thread **332** positioned between warp threads **330**, where warp threads **330** alternate between being positioned above and below weft thread **332**. It is understood that similarly numbered and/or named components may function in a substantially similar fashion. Redundant explanation of these components has been omitted for clarity.

Woven material **306** may include a plurality of distinct layers of warp threads **330**. In the non-limiting example shown in FIG. **5**, woven material **306** may be formed from four distinct layers (L**1**-L**4**) of the plurality of warp threads **330**. The first layer (L**1**) of the plurality of warp threads **330** may form a top surface of woven material **306**. The second layer (L**2**) of warp threads **330** may be positioned adjacent the first layer (L**1**) of warp threads **330**, and the third layer (L**3**) of warp threads may be positioned adjacent the second layer (L**2**). The second layer (L**2**) and third layer (L**3**) of warp threads **330** may collectively form the inner or interior layers of woven material **306**. Additionally, the warp layers **330** of the second layer (L**2**) and the third layer (L**3**) may not be visible to a user of wearable band **100** (see, FIG. **1**) formed from woven material **306**. The fourth layer (L**4**) of warp threads **330** may be positioned adjacent the third layer (L**3**) of warp threads **330**. The fourth layer (L**4**) of warp threads **330** may form a bottom surface of woven material **306**, opposite the top surface formed by the first layer (L**1**).

At least one weft thread **332** may be positioned between the plurality of warp threads **330** in the first layer (L**1**), the second layer (L**2**), the third layer (L**3**) and the fourth layer (L**4**). In the non-limiting example shown in FIG. **5**, weft thread **332** may be woven through and/or interlaced between all four layers of warp threads **330**, over or across the entire length of woven material **306**. Although single weft thread **332** is shown in FIG. **5**, it is understood that a plurality of weft threads may be used when forming woven material **306**. In a non-limiting example, each layer (L**1**-L**4**) of warp threads **330** may include an individual or distinct weft thread **332**.

Woven material **306** may also include at least one set of connection yarns **336**, **338**. Each set of connection yarns **336**, **338** may include at least two distinct yarns, and each yarn may be woven through weft thread **332** positioned between at least two distinct layers (L**1**-L**4**) of the plurality of warp threads **330**. In a non-limiting example shown in FIG. **5**, woven material **306** may include a first set of connection yarns **336**, and a second set of connection yarns **338**. In the non-limiting example of FIG. **5**, first set of connection yarns **336** may be woven through weft thread **332** positioned between warp threads **330** of the second layer (L**2**) and the third layer (L**3**) for coupling, binding and/or securing warp threads **330** and/or weft threads **332** of the second layer (L**2**) to warp threads **330** and/or weft threads **332** formed in the third layer (L**3**). Additionally, second set of connection yarns **338** may be woven through weft threads **332** positioned between warp threads **330** of the first layer (L**1**) and the fourth layer (L**4**). Second set of connection yarns **338** may couple, bind and/or secure warp threads **330** and/or weft threads **332** of the first layer (L**1**) to warp threads **330** and/or weft threads **332** formed in the fourth layer (L**4**). In addition to coupling, binding and/or securing the various threads (e.g., warp threads **330**, weft threads **332**) and/or layers (L**1**-L**4**) of woven material **306** together, each set of connection yarns **336**, **338** may provide additional support for maintaining a uniform thickness throughout woven material **306**.

FIGS. **6-13** show additional, non-limiting examples of woven material **306**. The additional, non-limiting examples

of woven material **306** shown in FIGS. **6-13** may include some similar components and/or features of woven material **306** shown in FIG. **5**, and some distinct features. The distinct features, discussed in detail below, may allow for increased flexibility in woven material **306**, and ultimately, increased flexibility in wearable band **100** formed from woven material **306**. The portion of woven material **306** depicted in FIGS. **6-13** may be a portion of the entire length of woven material **306**, and may not necessarily represent the weave pattern of the entire length of woven material **306**. As a result, woven material **306** of FIGS. **6-13** may be understood as depicting either a localized altered weave pattern formed in a portion of woven material **306**, or an altered weave pattern formed in the entire length of woven material **306**. In the non-limiting example where the weave pattern is altered in only a portion of woven material **306**, the portion of woven material **306** having the altered weave pattern may include the improved physical features (e.g., increased flexibility) by comparison with the remaining portions of woven material **306**.

Turning to FIG. **6**, the first set of connection yarns **336** may be woven through weft thread **332** positioned between warp threads **330** of the second layer (L**2**) and the third layer (L**3**), as similarly discussed herein with respect to FIG. **5**. However, distinct from FIG. **5**, the second set of connection yarns **338** may not be woven through any weft thread **332** and/or layers (L**1**-L**4**) of the plurality of warp threads **330** of woven material **306**. Rather, in the non-limiting example shown in FIG. **6**, the second set of connection yarns **338** may be positioned between, but not woven around, the plurality of warp threads **330** in the second layer (L**2**) and the third layer (L**3**). The second set of connection yarns **338** may also run along the length of the interior (e.g., not visible) of woven material **306**. As a result of the positioning of the second set of connection yarns **338** with woven material **306** shown in FIG. **6**, first layer (L**1**) and fourth layer (L**4**) of the plurality of warp threads **330** may only be secured to the remaining layers of woven material **306** using weft thread **332**. As such, first layer (L**1**) and fourth layer (L**4**) of the plurality of warp threads **330** of woven material **306** may have increased flexibility and/or may be able to move without moving distinct layers (e.g., second layer (L**2**)) of woven material **306**.

Additional portions of woven material **306** (not shown) may include additional features or components for coupling first layer (L**1**) and fourth layer (L**4**) of warp threads **330** to woven material **306**. In a non-limiting example, portions of woven material **306** surrounding the portion shown in FIG. **6** may have the second set of connection yarns **338** woven in a similar pattern to that shown in FIG. **5**, such that first layer (L**1**) and fourth layer (L**4**) of warp threads **330** are coupled to the remaining layers of woven material **306** using the second set of connection yarns **338**. In another non-limiting example where the weave pattern depicted in FIG. **6** represents the weave pattern for the entire length of woven material **306**, first layer (L**1**) and fourth layer (L**4**) of warp threads **330** may be coupled to the remaining layers of woven material **306** and the ends of woven material **306**. A variety of features, components and/or techniques may be used to couple first layer (L**1**) and fourth layer (L**4**) of warp threads **330** to the remaining layers of woven material **306**. For example, the layers of warp threads **330** in woven material **306** may be melted, crimped or embossed together at the ends of woven material **306**. In an additional non-limiting example, connection yarns may be woven through first layer (L**1**) and fourth layer (L**4**) of warp threads **330**, or all four layers (L**1**-L**4**) of warp threads **330** of woven material **306** to couple layers (L**1**-L**4**) to each other.

Similar to FIG. **6**, in an additional non-limiting example shown in FIG. **7**, the second set of connection yarns **338** may be positioned between, but not woven around, the plurality of warp threads **330** in the second layer (L**2**) and the third layer (L**3**). However, distinct from FIGS. **5** and **6**, the plurality of warp threads **330** in second layer (L**2**) and third layer (L**3**) may not continuously alternate positions (e.g., above, below) with respect to weft thread **332** positioned within second layer (L**2**) and third layer (L**3**). Rather, as shown in FIG. **7**, warp threads **330** of second layer (L**2**) and third layer (L**3**) may be parallel with the second set of connection yarns **338** and run along the length of woven material **306**. A single thread of the plurality of warp threads **330** in each of the second layer (L**2**) and the third layer (L**3**) may be positioned above weft thread **332**, and a distinct thread of warp threads **330** of the second layer (L**2**) and the third layer (L**3**) may be positioned above weft thread **332**. As a result, weft thread **332** positioned in second layer (L**2**) and third layer (L**3**) may still be positioned between the plurality of warp threads **330** formed in second layer (L**2**) and third layer (L**3**), as shown in FIG. **7**. In addition to increasing flexibility and movement in first layer (L**1**) and fourth layer (L**4**), as similarly discussed with respect to FIG. **6**, the non-limiting example of woven material **306** shown in FIG. **7** may increase flexibility and/or reduced stiffness in second layer (L**2**) and third layer (L**3**) of warp threads **330**, and ultimately, woven material **306**.

FIG. **8** shows another non-limiting example of woven material **306**. In FIG. **8**, first set of connection yarns **336** may be woven through weft thread **332** positioned between warp threads **330** of the second layer (L**2**) and the third layer (L**3**), and second set of connection yarns **338** may be woven through weft threads **332** positioned between warp threads **330** of the first layer (L**1**) and the fourth layer (L**4**). Additionally, and similar to woven material **306** shown in FIG. **7**, the plurality of warp threads **330** in second layer (L**2**) and third layer (L**3**) may not continuously alternate positions (e.g., above, below) with respect to weft thread **332** positioned within second layer (L**2**) and third layer (L**3**), but may run parallel along a length of woven material **306**. In the non-limiting example shown in FIG. **8**, woven material **306** may have increased flexibility and/or reduced stiffness as a result of the weave pattern of warp threads **330** in second layer (L**2**) and third layer (L**3**). Woven material **306** of FIG. **8** may also maintain connection between all four layers (L**1**-L**4**) of woven material **306** using first set of connection yarns **336** (e.g., second layer (L**2**) and third layer (L**3**)) and second set of connection yarns **338** (e.g., first layer (L**1**) and fourth layer (L**4**)).

In the non-limiting example shown in FIG. **9**, and similar to FIGS. **5** and **8**, second set of connection yarns **338** may be woven through weft threads **332** positioned between warp threads **330** of the first layer (L**1**) and the fourth layer (L**4**). Second set of connection yarns **338** may couple, bind and/or secure warp threads **330** and/or weft threads **332** of the first layer (L**1**) to warp threads **330** and/or weft threads **332** formed in the fourth layer (L**4**). In conjunction, second set of connection yarns **338** may indirectly couple, bind and/or secure second layer (L**2**) and third layer (L**3**) of warp threads **330** within woven material **306** by sandwiching second layer (L**2**) and third layer (L**3**) between connected first layer (L**1**) and fourth layer (L**4**).

Additionally in the non-limiting example of FIG. **9**, and similarly discussed with respect to FIGS. **7** and **8**, the plurality of warp threads **330** in second layer (L**2**) and third

layer (L3) may not continuously alternate positions (e.g., above, below) with respect to weft thread **332** positioned within second layer (L2) and third layer (L3), but may run parallel along a length of woven material **306**. Distinct from the examples discussed herein, first set of connection yarns **336** may not be woven through any weft thread **332** and/or layers (L1-L4) of the plurality of warp threads **330** of woven material **306**. Rather, in the non-limiting example shown in FIG. **9**, the first set of connection yarns **336** may be positioned between, but not woven around, the plurality of warp threads **330** in the second layer (L2) and the third layer (L3). The first set of connection yarns **336** may also run along the length of the interior (e.g., not visible) of woven material **306**. As a result of the unwoven pattern of the warp threads **330** in the second layer (L2) and third layer (L3), and the unwoven pattern of the first set of connection yarns **336**, second layer (L2) and third layer (L3), and ultimately woven material **306** of FIG. **9**, may have an increase in flexibility and/or a decrease in stiffness.

In additional non-limiting examples shown in FIGS. **10** and **11**, individual or distinct yarn **336***a*, **336***b* of first set of connection yarns **336** and yarn **338***a*, **338***b* of second set of connection yarns **338** may be utilized together in coupling, binding or securing layers (L1-L4) of woven material **306** together. As shown in FIGS. **10** and **11**, connection yarn **336***a* of first set of connection yarns **336** and connection yarn **338***a* of second set of connection yarns **338** may be woven through weft threads **332** positioned between warp threads **330** of the first layer (L1) and the second layer (L2). Connection yarns **336***a*, **338***a* of the first set of connection yarns **336** and the second set of connection yarns **338**, respectively, may couple, bind and/or secure warp threads **330** and/or weft threads **332** of the first layer (L1) to warp threads **330** and/or weft threads **332** formed in the second layer (L2). Additionally shown in FIGS. **10** and **11**, connection yarn **336***b* of first set of connection yarns **336** and connection yarn **338***b* of second set of connection yarns **338** may be woven through weft threads **332** positioned between warp threads **330** of the third layer (L3) and the fourth layer (L4) to couple, bind and/or secure warp threads **330** and/or weft threads **332** of the third layer (L3) and fourth layer (L4), respectively.

As a result of the coupling of first layer (L1) to second layer (L2) and third layer (L3) to fourth layer (L4), second layer (L2) and third layer (L3) may not be connected. As such, first layer (L1) and second layer (L2) may be free to move substantially independent of third layer (L3) and fourth layer (L4), which may increase flexibility and/or decrease stiffness in woven material **306**. Additionally, and as discussed in detail herein, the coupling of first layer (L1) to second layer (L2) and third layer (L3) to fourth layer (L4) may increase penetrability between second layer (L2) and third layer (L3).

Distinct from FIG. **10**, the plurality of warp threads **330** in second layer (L2) and third layer (L3) in FIG. **11** may not continuously alternate positions (e.g., above, below) with respect to weft thread **332** positioned within second layer (L2) and third layer (L3), but may run parallel along a length of woven material **306**. As discussed herein, the weave pattern of warp threads **330** in second layer (L2) and third layer (L3) of woven material **306**, as shown in FIG. **11**, may provide further flexibility and/or reduce the stiffness in between second layer (L2) and third layer (L3), and ultimately woven material **306**.

In further non-limiting examples shown in FIGS. **12** and **13**, first set of connection yarns **336** may be woven through weft thread **332** positioned between warp threads **330** of second layer (L2) and third layer (L3) for coupling, binding and/or securing warp threads **330** and/or weft threads **332** of second layer (L2) to warp threads **330** and/or weft threads **332** formed in third layer (L3). Additionally, woven material **306** shown in FIGS. **12** and **13** may include second set of connection yarns woven through weft thread **332** positioned between warp threads **330** of the second layer (L2) and the fourth layer (L4). Second set of connection yarns **338** may couple, bind and/or secure warp threads **330** and/or weft threads **332** of second layer (L2) to warp threads **330** and/or weft threads **332** formed in fourth layer (L4), and may in turn secure third layer (L3) between second layer (L2) and fourth layer (L4). In the non-limiting examples shown in FIGS. **12** and **13**, both first set of connection yarns **336** and second set of connection yarns **338** may be woven through weft threads **332** positioned between warp threads **330** of second layer (L2).

In the non-limiting example shown in FIGS. **12** and **13**, first set of connection yarns **336** and second set of connection yarns **338** may not be woven through weft thread **332** positioned within first layer (L1). As a result, first layer (L1) of warp threads **330** in woven material **306** may be disconnected from the remaining layers (L2-L4) of woven material **306**, and may be substantially free to move independent of second layer (L2), third layer (L3) and fourth layer (L4). In addition, by disconnecting first layer (L1) from the remaining layers (L2-L4) of woven material **306**, woven material **306** may be able to bend acutely without buckling inner layers (L2-L3) of woven material **306**. As such, first layer (L1) of woven material **306** may be oriented in a specific manner within wearable band **100** (see, FIG. **1**), such that first layer (L1) may typically bend, flex or curve in a single direction, and the remaining layers, and specifically inner layers, of woven material **306** may not buckle and maintain shape or rigidity for wearable band **100**.

Distinct from FIG. **12**, the plurality of warp threads **330** in second layer (L2) and third layer (L3) in FIG. **13** may not continuously alternate positions (e.g., above, below) with respect to weft thread **332** positioned within second layer (L2) and third layer (L3), but may run parallel along a length of woven material **306**. As discussed herein, the weave pattern of warp threads **330** in second layer (L2) and third layer (L3) of woven material **306**, as shown in FIG. **13**, may provide further flexibility and/or reduce the stiffness in between second layer (L2) and third layer (L3), and ultimately woven material **306**.

Although discussed herein as increasing flexibility through woven material **306** and/or wearable band **100**, it is understood that the distinct weave patterns of woven material **306** shown in FIGS. **6-13** may be locally formed within woven material **306**. That is, the non-limiting example weave patterns for woven material **306**, as shown in FIGS. **6-13**, may only be formed in a portion of wearable band **100** formed from woven material **306**. As such, only localized portions of wearable band **100** may include the benefits (e.g., increased flexibility, decreased stiffness, increased penetrability) discussed herein with respect to the non-limiting examples shown in FIGS. **6-13**. These locally formed weave patterns, which increase flexibility, may be formed in portions of wearable band **100** that are typically subject to frequent and extensive bending. For example, a weave pattern of woven material **306** discussed herein with respect to FIGS. **6-13** may be formed in a portion of wearable band **100** adjacent the housing of the electronic device that may typically bend around a user's wrist.

FIG. **14** shows an enlarged front view of a portion of woven material **306** used to form the wearable band **100** of

FIG. **1**. The portion of woven material **306** shown in FIG. **14** may include woven material **306** prior to the inclusion or attachment of connection device **108**, and ultimately the formation of wearable band **100** (see, e.g., FIG. **1**). As indicated by arrows in FIG. **14**, buckle **118** forming a portion of connection device **108** may be coupled to end **110** formed in woven material **306** via connection pin **340** (shown partially in phantom). Connection pin **340** may be positioned through and/or secured within woven material **306**. In a non-limiting example, and discussed in detail herein, pin **340** may be positioned between two distinct layers (e.g., second layer (L**2**), third layer (L**3**)) of woven material **306** for coupling buckle **118** of connection device **108** to end **110** when forming wearable band **100**.

As shown in FIG. **14**, woven material **306** may include a textured pattern. As discussed herein, woven material **306** may be formed from a plurality of warp threads **330**, at least one weft thread **332** (see, FIGS. **5-13**) coupled to, woven, and/or interlaced between the plurality of warp threads, and a plurality of connecting yarns. As discussed herein, woven material **306** may be woven or manufactured to include a first section **342**, and a second section **344** positioned adjacent first section **342**, where first section **342** and second section **344** may include distinct configurations or weave patterns within woven material **306**. First section **342** may include the majority of the body of wearable band **100** (see, FIG. **1**) and may include a weave pattern substantially similar to any of the non-limiting examples shown in FIGS. **5-13**.

Second section **344** of woven material **306** may be positioned substantially adjacent end **110**, and may include a distinct weave pattern from first section **342** for receiving pin **340** of connection device **108**. Turning to FIG. **15**, with continued reference to FIG. **14**, a side cross-section view of second section **344** of woven material **306** taken along line **16-16** is shown. As shown in FIG. **15**, the plurality of warp threads **330** and at least one weft thread **332** may be arranged in four distinct layers (L**1**-L**4**), as similarly discussed herein with respect to FIGS. **5-13**. Redundant explanation of these components and/or features have been omitted for clarity.

Second portion **344** of woven material **306** may also include a single set of connection yarns **346***a*, **346***b*. Similar to connection yarns discussed herein with respect to FIGS. **5-13**, single set of connection yarns **346***a*, **346***b* shown in FIG. **15** may be woven through weft thread **332** positioned between the plurality of warp threads **330** in distinct layers (L**1**-L**4**) of woven material **306** for coupling, binding and/or securing warp threads **330** and/or weft threads **332** of those layers together. However, distinct from the connection yarns discussed herein, single set of connection yarns **346***a*, **346***b* may alter its weave pattern over the length of woven material **306**. The altering of the weave pattern of single set of connection yarns **346***a*, **346***b* may achieve a localized separation **348** in woven material **306**, which may allow pin **340** (see, FIG. **14**) to be inserted into woven material **306**, as discussed herein.

As shown in the non-limiting example of FIG. **15**, a first portion **350** of second section **344** in woven material **306** may include single set of connection yarns **346***a*, **346***b* woven through weft thread **332** positioned between the plurality of warp threads **330** in first layer (L**1**) and fourth layer (L**4**). As discussed herein, connection yarns **346***a*, **346***b* in first portion **350** may couple, bind and/or secure warp threads **330** and/or weft threads **332** of first layer (L**1**) and fourth layer (L**4**) together, as well as, secure and/or sandwich warp threads **330** and/or weft threads **332** of second layer (L**2**) and third layer (L**3**) between first layer (L**1**) and fourth layer (L**4**).

In a second portion **352** of second section **344** of woven material **306**, the weave pattern of single set of connection yarns **346***a*, **346***b* may change. In second portion **352**, as shown in FIG. **15**, connection yarn **346***a* may not reach weft thread **332** positioned between warp threads **330** in fourth layer (L**4**) to continue the weave pattern achieved in first portion **350**. Rather, connection yarn **346***a* may move toward and be woven around weft thread **332** positioned between warp threads **330** in second layer (L**2**) in second portion **352**. Connection yarn **346***a* may be positioned between warp threads **330** in second layer (L**2**) and third layer (L**3**), and may run along a length of second portion **352** in second section **344** of woven material **306**, without being woven through weft threads **332** positioned within second layer (L**2**). As a result, connection yarn **346***a*, as shown in FIG. **15**, may pull warp threads **330** and/or weft threads **332** of second layer (L**2**) toward first layer (L**1**) of woven material **306**.

Additionally, connection yarn **346***b* may not reach weft thread **332** positioned between warp threads **330** in first layer (L**1**) to continue the weave pattern achieved in first portion **350**. Instead, connection yarn **346***b* may move toward and be woven around weft thread **332** positioned between warp threads **330** in third layer (L**3**) in second portion **352**. In the non-limiting example, connection yarn **346***b* may be positioned between warp threads **330** in second layer (L**2**) and third layer (L**3**), and may run along a length of second portion **352** in second section **344** of woven material **306**, parallel to connection yarn **346***a*, without being woven through weft threads **332** positioned within third layer (L**3**). As a result, connection yarn **346***b*, as shown in FIG. **15**, may pull warp threads **330** and/or weft threads **332** of third layer (L**3**) toward fourth layer (L**4**) of woven material **306**.

In third portion **354** in second section **344** of woven material **306**, single set of connection yarns **346***a*, **346***b* may resume the weave pattern included in first portion **350**. In the non-limiting example shown in FIG. **15**, single set of connection yarns **346***a*, **346***b* may be woven through weft thread **332** positioned between the plurality of warp threads **330** in first layer (L**1**) and fourth layer (L**4**) in third portion **354**.

The influence of connection yarn **346***a*, **346***b* on the inner layers (e.g., second layer (L**2**), third layer (L**3**)) of warp threads **330** and/or weft threads **332** may form localized separation **348** within second portion **352** in second section **344** of woven material **306**. In the non-limiting example shown in FIG. **15**, localized separation **348** formed between second layer (L**2**) and third layer (L**3**) may allow for woven material **306**, and specifically warp threads **330** and weft threads **332**, to be more easily separated to form a gap, space or opening between second layer (L**2**) and third layer (L**3**). As a result of forming localized separation **348** within woven material **306**, pin **340** (see, FIG. **14**) may be more easily inserted through and/or secured between second layer (L**2**) and third layer (L**3**) of warp threads **330** forming woven material **306**.

Once localized separation **348** is formed in woven material **306**, and pin **340** is inserted into localized separation **348**, woven material **306** may undergo further processes before connecting connection device **108**, and ultimately forming wearable band **100**. As discussed in detail below, the additional processes may be performed on second section **344** of woven material **306** in order to couple connec-

tion device **108** to pin **340** and/or to improve the cosmetics of end **110** of wearable band **100** including connection device **108**.

Localized separation **348** formed in second section **344** of woven material **306** may also be achieved by altering the weave pattern of the plurality of warp threads **330** used to form woven material **306**. In a non-limiting example shown in FIG. **16**, the weave pattern of warp threads **330***a*, **330***b* of second layer (L**2**), and warp threads **330***c*, **330***d* of third layer (L**3**) may be altered to form localized separation **348** in woven material **306**. As shown in FIG. **16**, localized separation **348** may be formed in an altered weave pattern portion **356** in second section **344** of woven material **306**, and pin **340** may be inserted into localized separation **348**.

In altered weave pattern portion **356**, as shown in FIG. **16**, warp thread **330***a* of second layer (L**2**) may be woven through weft thread **332** positioned between second layer (L**2**) and third layer (L**3**). Additionally, warp thread **330***b* of second layer (L**2**) may be positioned between weft thread **332** positioned within first layer (L**1**) and second layer (L**2**), and may run along the length of woven material **306** within altered weave pattern portion **356** without being woven around weft thread **332**. Like warp thread **330***a*, warp thread **330***c* of third layer (L**3**) may be woven through weft thread **332** positioned between second layer (L**2**) and third layer (L**3**). Warp thread **330***a* of second layer (L**2**) and warp thread **330***c* of third layer (L**3**) may be woven within woven material **306** to couple, bind and/or secure second layer (L**2**) and third layer (L**3**). In the non-limiting example, warp thread **330***d* of third layer (L**3**) may be positioned between weft thread **332** positioned within third layer (L**3**) and fourth layer (L**4**). Warp thread **330***d* may run along the length of woven material **306** within altered weave pattern portion **356** without being woven around weft thread **332**.

Localized separation **348** may be formed in altered weave pattern portion **356** in second section **344** of woven material **306** by allowing warp thread **330***a* of second layer (L**2**) and warp thread **330***c* of third layer (L**3**) to pass over at least one weft thread **332** in second layer (L**2**) and third layer (L**3**), respectively. In the non-limiting example shown in FIG. **16**, the center of altered weave pattern portion **356** shows warp thread **330***a* of second layer (L**2**) and warp thread **330***c* of third layer (L**3**) temporarily discontinuing its weave pattern for a portion of the length of altered weave pattern portion **356**. In this portion of altered weave pattern portion **356**, warp thread **330***a* of second layer (L**2**) may be positioned above weft thread **332** positioned within second layer (L**2**), and may move along a length of woven material **306** between weft thread **332** in first layer (L**1**) and second layer (L**2**). Additionally in this portion of altered weave pattern portion **356**, warp thread **330***c* of third layer (L**3**) may be positioned below weft thread **332** positioned within third layer (L**3**). In this portion, warp thread **330***c* of third layer (L**3**) may move along a length of woven material **306** between weft thread **332** in third layer (L**3**) and fourth layer (L**4**). This portion of temporary, discontinued weave pattern between warp thread **330***a* of second layer (L**2**) and warp thread **330***c* of third layer (L**3**) may form localized separation **348** in woven material **306**.

FIGS. **17**A and **17**B show an additional, non-limiting embodiment of woven material **406** including localized separation **448**. Woven material **406**, as shown in FIGS. **17**A and **17**B, may include a similar weave pattern to that shown and discussed with respect to FIG. **16**. However, distinct from the woven material shown in FIG. **16**, woven material **406** of FIG. **17**A may include distinct material used for warp threads **458***a*, **458***b*, **458***c*, **458***d*. In the non-limiting example, warp threads **458***a*, **458***b*, **458***c*, **458***d* used in forming second layer (L**2**) and third layer (L**3**) may include a distinct material from warp threads **430** used in forming first layer (L**1**) and fourth layer (L**4**). The material used in forming warp threads **458***a*, **458***b*, **458***c*, **458***d* of second layer (L**2**) and third layer (L**3**) may include a melting temperature substantially lower than the melting temperature of the material forming warp threads **430** of first layer (L**1**) and fourth layer (L**4**).

As a result, after pin **440** is inserted into localized separation **448** in woven material **406**, woven material **406** may be substantially heated to the melting temperature of warp threads **458***a*, **458***b*, **458***c*, **458***d* forming second layer (L**2**) and third layer (L**3**). Warp threads **458***a*, **458***b*, **458***c*, **458***d* of second layer (L**2**) and third layer (L**3**) (see FIG. **17**A) may substantially melt within woven material **406** to form a material melt region **460**. The material melt region **460** formed by melted warp threads **458** second layer (L**2**) and third layer (L**3**) may be formed within woven material **406** without altering the physical appearance and/or characteristics of the rest of woven material **406**. Additionally, material melt region **460** may provide rigidity to woven material **406** forming wearable band **100** (see, FIG. **1**). Finally, and as shown in FIG. **17**B, material melt region **460** may expand and/or contact unmelted warp threads **430** forming first layer (L**1**) and fourth layer (L**4**), and may couple, bind and/or secure first layer (L**1**) and fourth layer (L**4**) together, as similarly discussed herein with respect to the connection yarns included in woven material (see, FIGS. **5-13**).

Although shown as a unitary layer or portion, it is understood that material melt region **460** may not expand as much as depicted in FIG. **17**B. In an additional non-limiting example, each warp thread **458***a*, **458***b*, **458***c*, **458***d* melted to form material melt region **460** in woven material **406** may be melted to form two distinct material melt regions **460** that do not contact one another and/or do not contact adjacent first layer (L**1**) and/or fourth layer (L**4**) of warp threads **430** of woven material **406**.

Although discussed herein as forming localized separation **348**, **448** between second layer (L**2**) and third layer (L**3**) of woven material **306**, **406**, it is understood that localized separation **348**, **448** may be formed between any two distinct layers (L**1**-L**4**) of woven material **306**, **406**.

FIG. **18** depicts an example process for forming a wearable band for an electronic device. Specifically, FIG. **18** is a flowchart depicting one example process **500** for forming a wearable band from a woven material. In some cases, the process may be used to form the wearable band from woven material, as discussed above with respect to FIGS. **14-17**B.

In operation **502**, a weave pattern of a woven material may be altered. The woven material may include four distinct layers of a plurality of warp threads and at least one weft thread. The at least one weft thread may be coupled to, woven or interlaced between the plurality of warp threads in each of the four distinct layers. In a non-limiting example, each of the plurality of warp threads may alternate between being positioned above and below the weft thread, where at least one of the plurality of warp threads is positioned on an opposite side of the weft thread than a distinct warp thread. In the non-limiting example, woven material may include a connection yarn which may include an altered weave pattern for coupling, binding and/or securing layers of the woven material together. The altered weave pattern of the connection yarn may enable the first layer and the second layer to being bound, and distinctly, the third layer and the fourth layer to being bound.

In an additional, non-limiting example, the weave pattern for the plurality of warp threads in the second layer and the third layer may be altered. In the additional, non-limiting example, a warp thread of the second layer and a warp thread of the third layer are woven between the second layer and the third layer over a portion of the length of the woven material.

In operation **504**, a localized separation between two distinct layers of the four distinct layers of the woven material may be formed. The localized separation formed between the two distinct layers of the woven material may receive a pin for coupling a connection device to the woven material. The forming of the localized separation in the woven material may be achieved using the altered weave pattern of the connection yarn and/or the warp threads in the woven material. The connection yarns and/or warp threads, including the altered weave pattern, may secure two adjacent layers of the four layers of woven material, creating a spacing between each of the pair of adjacent layers secured together.

In operation **506**, a pin aperture may be formed in the side of the woven material. The pin aperture may be formed inside of the woven material, adjacent the localized separation formed in operation **504**. Specifically, the pin aperture may be formed on the side of woven material, and may be aligned with the localized separation. The forming of the pin aperture may further include creating an opening through the woven material, including the localized separation, for receiving the pin.

In operation **508**, a pin may be inserted through the localized separation formed in the woven material. The pin may be inserted through the pin aperture, and completely though the woven material via the localized separation. The inserting of the pin through the localized separation may also include securing the pin within the localized separation between two distinct layers of the woven material.

In operation **510**, a portion of the woven material positioned adjacent the localized separation and pin may be processed. The processing of the portion of the woven material positioned adjacent the localized separation may transform woven material into a wearable band for an electronic device. The processing of the portion of the woven material positioned adjacent the localized separation may further include hot pressing the portion of the woven material, pinching the portion of the woven material and/or laser cutting the portion of the woven material. Additionally, the laser cut portion of the woven material positioned adjacent the localized separation may undergo further processes including sanding of the laser cut portion of the woven material, debos sing the laser cut portion of the woven material, and/or melting the laser cut portion of the woven material.

Finally, in operation **512**, a connection device may be coupled to the pin inserted through the localized separation formed between the two distinct layers of the woven material. The connection device may be coupled to the pin after the portion of the woven material positioned adjacent the localized separation is processed, or in an alternative, operation **510** may be omitted, and the connection device may be coupled to the pin after insertion of the pin through the localized separation in the woven material (e.g., operation **508**). The coupling of the connection device to the pin may form the wearable band to be utilized with a wearable electronic device.

FIG. **19** shows a cross-section side view of woven material **606** used to form multiple wearable bands **100** of FIG. **1** from a single piece of woven material **606**. In the non-limiting example shown in FIG. **19**, woven material **606** may show the end or completion of a first wearable band **100***a* and the beginning or start of a second wearable band **100***b*. First wearable band **100***a* may end and/or be cut along a first cut line (CL**1**) adjacent a pin region (PR). Pin region (PR) may represent the portion of woven material **606** that may include localized separation **648** and/or connection pin **640** positioned within localized separation **648** to couple connection device **108** to end **110** of woven material **606**, as similarly discussed with respect to FIGS. **14-18**.

Additionally as shown in FIG. **19**, woven material **606** may also include a transition region (TR) formed between first wearable band **100***a* and second wearable band **100***b*. In the non-limiting example, transition region (TR) may be formed after the first cut line (CL**1**) forming first wearable band **100***a*, and before the weave pattern for the warp threads **630**, weft threads **632** and/or connection yarns **646** are altered and/or changed, as discussed in detail herein. Transition region (TR) may undergo various processes prior to being removed from woven material **606**, and ultimately forming first wearable band **100***a* and second wearable band **100***b*. In non-limiting examples, woven material **606** in transition region (TR) may be melted and/or pinched, as similarly discussed herein with respect to FIGS. **3-5**. The melting and/or pinching of transition region (TR) may take place prior to or after cutting woven material **606** along first cut line (CL**1**) to form first wearable band **100***a*. As discussed herein, melting and/or pinching woven material **606** may provide woven material **606** with a reduced thickness and/or may have a desirable cosmetic appearance by reducing fraying and/or preventing unwoven threads when forming ends for first wearable band **100***a* and second wearable band **100***b*. After woven material **606** formed in transition region (TR) is melted and/or pinched, transition region of woven material **606** may be cut adjacent second wearable band **100***b*, along second cut line (CL**2**).

As shown in FIG. **19**, the weave pattern of woven material **606** may be altered to form first wearable band **100***a* and second wearable band **100***b* from a single piece of woven material **606**, and also to form localized separation **648** for receiving connection pin **640**. As discussed in detail below, the weave pattern may be altered for warp threads **630**, and/or the various connection yarns **646** forming woven material **606**.

A portion of warp threads **630** may have a constant weave pattern, and the remaining portion of warp threads **630** may have an altered weave pattern when forming first wearable band **100***a* and second wearable band **100***b* from woven material **606**. In a non-limiting example shown in FIG. **19**, warp threads **630** forming first layer (L**1**) and fourth layer (L**4**) of the plurality of warp threads **630** may have a weave pattern that may be constant and/or may not be altered when forming first wearable band **100***a* and second wearable band **100***b*. In the non-limiting example, and as similarly discussed herein with respect to FIG. **5**, warp threads **630** of first layer (L**1**) and fourth layer (L**4**) may alternate between being positioned above and below weft thread **632**.

Warp threads **630** of second layer (L**2**) and third layer (L**3**) may have an altered weave pattern in woven material **606**. In the non-limiting example shown in FIG. **19**, warp threads **630** of second layer (L**2**) and third layer (L**3**) may have a similar weave pattern to warp threads **630** of first layer (L**1**) and fourth layer (L**4**) in the portions of woven material **606** surrounding pin region (PR) (e.g., first wearable band **100***a*, transition region (TR), second wearable band **100***b*). However, in pin region (PR) of woven material **606**, the weave pattern of warp threads **630** in second layer

(L2) and third layer (L3) may be substantially altered. As shown in FIG. **19**, both warp threads **630** of second layer (L2) may be positioned above the weft threads **632** of second layer (L2) and/or may be positioned between weft threads **632** formed in first layer (L1) and second layer (L2). Additionally, both warp threads **630** of third layer (L3) may be positioned below the weft threads **632** of third layer (L3) and/or may be positioned between weft threads **632** formed in third layer (L3) and fourth layer (L4). As shown in FIG. **19**, no warp threads **630** may separate and/or be positioned between the weft threads **632** formed in second layer (L2) and third layer (L3) in pin region (PR) of woven material **606**. As a result of warp threads **630** altered weave pattern in pin region (PR), and because of the weave pattern of connection yarns **646** discussed in detail below, localized separation **648** may be formed between second layer (L2) and third layer (L3) of warp threads **630** for receiving connection pin **640**.

As shown in FIG. **19**, woven material **606** may have four distinct connection yarns **646***a*, **646***b*, **646***c*, **646***d* utilized to form first wearable band **100***a* and second wearable band **100***b*. Depending on the region (e.g., wearable band **100**, pin region (PR), transition region (TR)) of woven material **606**, connection yarns **646***a*, **646***b*, **646***c*, **646***d* may have a unique or altered weave pattern. In the non-limiting example, first connection yarn **646***a* and second connection yarn **646***b* may be woven through weft threads **632** positioned between first layer (L1) and the fourth layer (L4) of warp threads **630** in the portion of first wearable band **100***a* positioned adjacent pin region (PR). First connection yarn **646***a* and second connection yarn **646***b* may be alternately woven, such that when first connection yarn **646***a* is woven around weft thread **632** in first layer (L1), second connection yarn **646***b* is woven around weft thread **632** in fourth layer (L4), and vice versa.

At pin region (PR) however, the weave pattern of first connection yarn **646***a* and second connection yarn **646***b* may be altered. In the non-limiting example shown in FIG. **19**, first connection yarn **646***a*, beginning in pin region (PR), may be woven through weft threads **632** positioned between third layer (L3) and fourth layer (L4) of warp threads **630**. As a result, first connection yarn **646***a* may not pass between second layer (L2) and third layer (L3) of warp threads **630** in pin region (PR) and/or may not pass through localized separation **648** formed in woven material **606**. Additionally, in the non-limiting example shown in FIG. **19**, second connection yarn **646***b*, beginning in pin region (PR), may be woven through weft threads **632** positioned between first layer (L1) and second layer (L2) of warp threads **630**. Similar to first connection yarn **646***a*, second connection yarn **646***b* may not pass between second layer (L2) and third layer (L3) of warp threads **630** in pin region (PR) and/or may not pass through localized separation **648** formed in woven material **606**. The altered weave pattern for first connection yarn **646***a* and second connection yarn **646***b* may be maintained through pin region (PR) and transition region (TR) of woven material **606**, as shown in FIG. **19**.

At the end of transition region (TR), and/or the beginning of second wearable band **100***b*, the weave pattern of first connection yarn **646***a* and second connection yarn **646***b* may be altered again. In the non-limiting example shown in FIG. **19**, first connection yarn **646***a*, beginning at second cut line (CL2) or second wearable band **100***b*, may be woven through weft threads **632** positioned between second layer (L2) and third layer (L3) of warp threads **630**. Additionally, in the non-limiting example shown in FIG. **19**, second connection yarn **646***b*, beginning at second cut line (CL2) or second wearable band **100***b*, may also be woven through weft threads **632** positioned between second layer (L2) and third layer (L3) of warp threads **630**, opposite first connection yarn **646***a*. By comparison, first connection yarn **646***a* and second connection yarn **646***b* may connect outer layers (e.g., first layer (L1), fourth layer (L4)) in first wearable band **100***a*, and connect inner layers (e.g., second layer (L2), third layer (L3)) in second wearable band **100***b* as a result of the unique or altered weave pattern in woven material **606**.

Third connection yarn **646***c* and fourth connection yarn **646***d* may also have altered weave patterns in woven material **606**. In the non-limiting example shown in FIG. **19**, third connection yarn **646***c* and fourth connection yarn **646***d* may be woven through weft threads **632** positioned between second layer (L2) and third layer (L3) of warp threads **630** in the portion of first wearable band **100***a* positioned adjacent pin region (PR). Third connection yarn **646***c* and fourth connection yarn **646***d* may be alternately woven, such that when third connection yarn **646***c* is woven around weft thread **632** in second layer (L2), fourth connection yarn **646***d* is woven around weft thread **632** in third layer (L3), and vice versa.

At pin region (PR) however, the weave pattern of third connection yarn **646***c* and fourth connection yarn **646***d* may be altered. In the non-limiting example shown in FIG. **19**, third connection yarn **646***c*, beginning in pin region (PR), may be woven through weft threads **632** positioned between first layer (L1) and second layer (L2) of warp threads **630**. As a result, and similar to first connection yarn **646***a* and second connection yarn **646***b*, third connection yarn **646***c* may not pass between second layer (L2) and third layer (L3) of warp threads **630** in pin region (PR) and/or may not pass through localized separation **648** formed in woven material **606**. Additionally, in the non-limiting example shown in FIG. **19**, fourth connection yarn **646***d*, beginning in pin region (PR), may be woven through weft threads **632** positioned between third layer (L3) and fourth layer (L4) of warp threads **630**. Similar to third connection yarn **646***c*, fourth connection yarn **646***d* may not pass between second layer (L2) and third layer (L3) of warp threads **630** in pin region (PR) and/or may not pass through localized separation **648** formed in woven material **606**. The altered weave pattern for third connection yarn **646***c* and fourth connection yarn **646***d* may be maintained through pin region (PR) and transition region (TR) of woven material **606**, as shown in FIG. **19**.

At the end of transition region (TR), and/or the beginning of second wearable band **100***b*, the weave pattern of third connection yarn **646***c* and fourth connection yarn **646***d* may be altered again. In the non-limiting example shown in FIG. **19**, third connection yarn **646***c*, beginning at second cut line (CL2) or second wearable band **100***b*, may be woven through weft threads **632** positioned between first layer (L1) and fourth layer (L4) of warp threads **630**. Additionally, in the non-limiting example shown in FIG. **19**, fourth connection yarn **646***d*, beginning at second cut line (CL2) or second wearable band **100***b*, may also be woven through weft threads **632** positioned between first layer (L1) and fourth layer (L4) of warp threads **630**, opposite third connection yarn **646***c*. By comparison, third connection yarn **646***c* and fourth connection yarn **646***d* may connect inner layers (e.g., second layer (L2), third layer (L3)) in first wearable band **100***a*, and connect outer layers (e.g., first layer (L1), fourth layer (L4)) in second wearable band **100***b* as a result of the unique or altered weave pattern in woven material **606**. This may be the opposite to the connections formed using first

connection yarn **646***a* and second connection yarn **646***b* in first wearable band **100***a* and second wearable band **100***b*, respectively.

As shown in FIG. **19**, weft threads **632** may also include a unique and/or altered weave pattern when forming first wearable band **100***a* and second wearable band **100***b* from woven material **606**. In the non-limiting example, and distinct from woven material **306** discussed herein with respect to FIGS. **15** and **16**, woven material **606** may include weft thread **632** passing through each layer of warp threads **630** twice between every transition of warp threads **630**. As shown in FIG. **19**, each of the four distinct layers (L**1**-L**4**) of the plurality of warp threads **630** may have warp thread **632** pass between the warp threads twice, before warp threads **630** alternate positions (e.g., above, below) with respect to weft thread **632**.

The weave pattern of weft threads **632** may also be altered dependent on the region (e.g., wearable band **100**, pin region (PR), transition region (TR)) of woven material **606**. As shown in FIG. **19**, weft thread **632** may be formed within woven material **606** by a first weave pattern (WP**1**) in the portion of first wearable band **100***a* positioned adjacent pin region (PR), in transition region (TR) and/or in second wearable band **100***b*. In pin region (PR) however, weft thread **632** may be formed in woven material **606** by a second weave pattern (WP**2**). Second weave pattern (WP**2**) of weft thread **632** in pin region (PR) may ease the initial insertion of pin **340** of connection device **108** (see, FIG. **14**) through localized separation **648** in woven material **606** and/or may allow a portion of pin **340** to more easily exit woven material **606** prior to coupling connection device **108** to pin **340**. Additionally, and as discussed herein, localized separation **648** formed in woven material **606** may be more easily accessed in portions of woven material **606** having weft threads **632** woven using second weave pattern (WP**2**).

Turning to FIGS. **20** and **21**, and with continued reference to FIG. **19**, first weave pattern (WP**1**) and second weave pattern (WP**2**) of weft thread **632** of woven material **606** are shown. The arrows depicted in FIGS. **20** and **21** may represent weft thread **632**, and may also indicate the direction and/or order in which weft thread **632** is woven within woven material **606**. Warp threads **630** may be omitted for clarity from FIGS. **20** and **21**. However, it is understood that the plurality of warp threads **630** formed in the four distinct layers (L**1**-L**4**) may alternate between being positioned above and below the two distinct passes of weft thread **632** in each of the layers (L**1**-L**4**), as discussed herein. Additionally, it is understood that weft thread **632** shown in FIGS. **20** and **21** may be woven much tighter than depicted, and the weave patterns for weft thread **632** shown in FIGS. **20** and **21** may be spread out and/or distanced for clarity and exemplary purposes.

As discussed herein, weft thread **632** may be formed from a single piece of thread that may be interwoven through all layers (L**1**-L**4**) of warp threads, along the entire length of woven material **606**. In the non-limiting examples shown in FIGS. **20** and **21**, weft thread **632** of woven material **606** may have incoming thread portions **662** and outgoing thread portion **664**. Incoming thread portions **662** may be weft thread **632** that was previously woven through the four distinct layers (L**1**-L**4**) of warp threads **630** positioned adjacent the portion to be woven by weft thread **632**. Additionally, outgoing thread portion **664** may be weft thread **632** that may be woven through subsequent portions of the four distinct layers (L**1**-L**4**) of warp threads **630** forming woven material **606**.

Additionally, FIGS. **20** and **21** show material sides **668***a*, **668***b* for woven material **606**. Material sides **668***a*, **668***b* of woven material **606** may determine the width of wearable band **100** (see, FIG. **1**) formed from woven material **606**. As similarly discussed herein, it is understood that the dimensions and/or spacing of material sides **668***a*, **668***b* of woven material **606**, as shown in FIGS. **20** and **21**, may be merely exemplary, and may not necessarily represent the distance between weft thread **632** as it is woven through woven material **606**.

FIG. **20** shows first weave pattern (WP**1**) for weft thread **632** of woven material **606**. In first weave pattern (WP**1**), weft thread **632** may continuously move between material side **668***a* and material side **668***b* of woven material **606** and may pass through the four distinct layers (L**1**-L**4**) of warp threads **630**. In the non-limiting example shown in FIG. **20**, incoming thread portion **662** of weft thread **632** may first enter in third layer (L**3**) of warp threads **630**. From there, weft thread **632** may be woven, in order, through third layer (L**3**) of warp threads **630**, second layer (L**2**) of warp threads **630**, fourth layer (L**4**) of warp threads **630** and finally, first layer (L**1**) of warp threads **630**, as shown in FIG. **20**. From first layer (L**1**) of warp threads **630**, outgoing thread portion **664** of weft thread **632** may be woven through a subsequent portion of warp threads **630** of woven material **606**.

As shown in FIG. **20**, weft thread **632** may be woven through itself on material side **668***a*, such that the portions of weft thread **632** in the four distinct layers (L**1**-L**4**) of warp threads **630** may be intertwined and/or interwoven. Additionally, weft thread **632** may loop between distinct layers of warp threads **630** on material side **668***b* as it is woven using first weave pattern (WP**1**). As weft thread **632** loops between distinct layers (L**1**-L**4**) of warp threads **630** of woven material **606**, portions of weft thread **632** on material side **668***b* may also overlap weft thread **632** in distinct layers. In a non-limiting example shown in FIG. **20**, the portion of weft thread **632** looping from second layer (L**2**) to fourth layer (L**4**) on material side **668***b* may overlap weft thread **632** positioned in second layer (L**2**) and third layer (L**3**). In another non-limiting example shown in FIG. **20**, the portion of weft thread **632** looping from fourth layer (L**4**) to first layer (L**1**) on material side **668***b* may overlap weft thread **632** positioned in second layer (L**2**), third layer (L**3**) and fourth layer (L**4**).

FIG. **21** shows second weave pattern (WP**2**) for weft thread **632** of woven material **606**. Similar to weft thread **632** in first weave pattern (WP**1**), weft thread **632** in second weave pattern (WP**2**) may continuously move between material side **668***a* and material side **668***b* of woven material **606** and may pass through the four distinct layers (L**1**-**4**) of warp threads **630**. In the non-limiting example shown in FIG. **21**, incoming thread portion **662** of weft thread **632** may first enter in fourth layer (L**4**) of warp threads **630**. From there, weft thread **632** may be woven, in order, through fourth layer (L**4**) of warp threads **630**, third layer (L**3**) of warp threads **630**, second layer (L**2**) of warp threads **630** and finally, first layer (L**1**) of warp threads **630**, as shown in FIG. **21**. From first layer (L**1**) of warp threads **630**, outgoing thread portion **664** of weft thread **632** may be woven through a subsequent portion of warp threads **630** of woven material **606**.

As similarly discussed herein with respect to FIG. **20**, weft thread **632** may be woven through, interwoven and/or interlace distinct layers of warp threads **630** on material side **668***a*. Additionally, as shown in FIG. **21**, and similar to FIG. **20**, weft thread **632** may be looped between distinct layers (L**1**-**4**) of warp threads **630** on material side **668***b*. However,

distinct from first weave pattern (WP1), no portion of weft thread **632** may overlap another distinct layer of weft thread **632** in second weave pattern (WP2). Because weft thread **632** does not overlap when woven using second weave pattern (WP2), each of the four distinct layers (L1-L4) of warp threads **630** may be more easily separated then the four distinct layers (L1-L4) of warp threads **630** having weft thread **632** woven using first weave pattern (WP1). As a result, pin region (PR), which may have weft thread **632** woven using second weave pattern (WP2), may allow for easier access to and/or easier penetration of pin **340** in/out of localized separation **648** formed in woven material **606**.

The weave pattern of a woven material may be altered to provide a locally thinned portion in the woven material to improve the melting and/or pinching process performed on the woven material. Additionally, the locally thinned portion of the woven material may provide better cosmetic features and/or appearance of the melted/pinched woven material when the woven material is utilized in a wearable band for an electronic device. Additionally, the altering of the weave pattern of the woven material may increase flexibility in the woven material and/or reduce stiffness. Also, the weave pattern of the woven material may be altered to create a localized separation between the plurality of layers forming the woven material. This localized separation may allow components of the wearable band to be more easily inserted through and/or secured within the woven material used to form the wearable band of the electronic device. The altering of the weave pattern may be achieved by altering a weave pattern of the plurality of warp threads of the woven material, and/or at least one connection yarn woven through the woven material.

The foregoing description, for purposes of explanation, used specific nomenclature to provide a thorough understanding of the described embodiments. However, it will be apparent to one skilled in the art that the specific details are not required in order to practice the described embodiments. Thus, the foregoing descriptions of the specific embodiments described herein are presented for purposes of illustration and description. They are not targeted to be exhaustive or to limit the embodiments to the precise forms disclosed. It will be apparent to one of ordinary skill in the art that many modifications and variations are possible in view of the above teachings.

We claim:

1. A watchband comprising:

a first portion comprising a weave pattern formed by warp threads and at least one weft thread woven between the warp threads and in which adjacent first passes of the at least one weft thread are separated from each other by a first distance; and

a locally thinned portion positioned adjacent the first portion, the locally thinned portion comprising an altered weave pattern formed by woven material comprising the warp threads and the at least one weft thread and in which adjacent second passes of the at least one weft thread are separated from each other by a second distance, the second distance being greater than the first distance, wherein the locally thinned portion has an average thickness between the adjacent second passes of the at least one weft thread that is smaller than an average thickness between the adjacent first passes of the at least one weft thread in the first portion, and the locally thinned portion defines a melt region in which the woven material is fused together, and the first portion is outside the melt region such that the warp threads and the at least one weft thread are not fused together in the first portion.

2. The watchband of claim **1**, wherein the locally thinned portion extends over a predetermined portion of a length of the watchband.

3. The watchband of claim **1**, wherein the first portion has a first thickness and the locally thinned portion comprises a second thickness smaller than the first thickness of the first portion.

4. The watchband of claim **1**, wherein the warp threads alternate between being positioned above and below the at least one weft thread in the first portion and the locally thinned portion.

5. The watchband of claim **3**, further comprising a distinct portion positioned opposite the first portion, and separated from the first portion by the locally thinned portion, the distinct portion having the first thickness.

6. The watchband of claim **1**, wherein:

the first portion and the locally thinned portion are along a first band portion comprising an end configured to couple to a housing of a watch; and

the watchband further comprises:

a second band portion comprising:

a first end comprising a connection device configured to couple to the first band portion; and

a second end configured to couple to the housing of the watch.

7. A watchband comprising:

woven material comprising warp threads and a weft thread that form:

a first portion in which at least some of the warp threads and the weft thread are woven together and in which adjacent first passes of the weft thread are separated from each other by a first distance; and

a second portion defining a melt region in which the woven material is fused together only in the second portion and in which adjacent second passes of the weft thread are separated from each other by a second distance greater than the first distance, the second portion having an average thickness that is smaller than an average thickness of the first portion, wherein the first portion is outside the melt region.

8. The watchband of claim **7**, wherein the second portion extends over a predetermined portion of a length of the watchband.

9. The watchband of claim **7**, wherein the warp threads alternate between being positioned above and below the weft thread in the first portion and the second portion.

10. The watchband of claim **7**, further comprising a third portion positioned opposite the first portion, and separated from the first portion by the second portion, the third portion having a thickness equal to a thickness of the first portion.

11. The watchband of claim **7**, wherein:

the first portion and the second portion are along a first band portion comprising an end configured to couple to a housing of a watch; and

the watchband further comprises:

a second band portion comprising:

a first end comprising a connection device configured to couple to the first band portion; and

a second end configured to couple to the housing of the watch.

12. A watchband comprising:

woven material comprising warp threads and weft threads that form:

a first portion in which at least some of the warp threads and at least some of the weft threads are woven

together and in which adjacent passes of the weft threads are separated from each other by a first distance; and

a second portion defining a melt region in which the woven material is fused together only in the second portion and in which adjacent passes of the weft threads are separated from each other by a second distance greater than the first distance, the second portion having an average thickness that is smaller than an average thickness of the first portion, wherein the first portion is outside the melt region.

13. The watchband of claim **12**, wherein the second portion extends over a predetermined portion of a length of the watchband.

14. The watchband of claim **12**, wherein the warp threads alternate between being positioned above and below the weft threads in the first portion and the second portion.

15. The watchband of claim **12**, further comprising a third portion positioned opposite the first portion, and separated from the first portion by the second portion, the third portion having a thickness equal to a thickness of the first portion.

16. The watchband of claim **12**, wherein:

the first portion and the second portion are along a first band portion comprising an end configured to couple to a housing of a watch; and

the watchband further comprises:

a second band portion comprising:

a first end comprising a connection device configured to couple to the first band portion; and

a second end configured to couple to the housing of the watch.

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